

**BAY AREA**  
**'97 CLEAN AIR PLAN**  
*Volume II*  
**APPENDIX E**  
**Transportation Control Measure**  
**Descriptions**



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**Prepared by**  
**Bay Area Air Quality Management District**  
**in cooperation with**  
**Metropolitan Transportation Commission**  
**and**  
**Association of Bay Area Governments**

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The transportation control measures (TCMs) in this appendix were designed to reduce emissions from motor vehicles by reducing vehicle trips and vehicle miles traveled. TCMs may also reduce vehicle use, vehicle idling or traffic congestion. Some of the TCMs in the 1997 CAP are included in local, regional and state transportation programs. We expect to see those measures implemented, and achieve the emissions reductions we have projected. Other measures have little or no funding, and may require legislative authorization and voter approval prior to implementation. One example is TCM 18, Transportation Pricing Reform. While the Air District would also like to see the most effective TCMs implemented, we acknowledge that there are significant obstacles that first must be overcome. Public education efforts must be undertaken in order to gain acceptance of these often-controversial measures.



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## TCM 1 - SUPPORT VOLUNTARY EMPLOYER-BASED TRIP REDUCTION PROGRAMS

### Purpose

TCM 1 will support and encourage voluntary efforts by Bay Area employers to promote the use of commute alternatives by their employees.

### Background

The political and economic climate for employer-based trip reduction has changed dramatically since the 1994 CAP was prepared. Major developments include 1) the enactment of SB 437 which prohibited mandatory employer trip reduction programs as of January 1, 1996, and 2) the reduction in public sector funding for transportation demand management programs.

Despite these developments, the need for trip reduction programs remains strong. As the Bay Area economy recovers from the recession of the early 1990's, employment is growing, which means that peak period congestion will increase. Employment continues to increase fastest in suburban areas which, due to the land use patterns and transportation infrastructure, have the highest drive alone rates.

Commute trips and work sites are still logical targets for employer-based trip reduction efforts due to: a) their key role in contributing to peak period traffic congestion and ozone formation, b) the long average distance of commute trips compared to other trip types, c) the repetitive nature of commute trips, such that most occur on the same route and schedule each day, d) the pool of potential candidates for ridesharing at larger work sites, and e) the ability of employers to influence employee commute mode choice by means of the facilities, services, and incentives that they provide.

While the need for employer programs is undiminished, TCM 1 must be revised in light of the new climate. The TCM will focus on assessing employer needs and maintaining core support services to employers.

### Description

TCM 1 includes the following:

- Developing a strategy to provide core support for employer programs, based on an assessment of employer needs and the level of employer interest. Potential support includes assistance in developing or enhancing employer programs, information and referrals, employer networks, and programs to recognize outstanding employer programs. MTC and the Bay Area Partnership will develop this strategy, in cooperation with employers and BayCAP), as part of its role in administering the regional ridesharing program.
- Support for legislation to maintain and expand incentives for employer programs, such as tax deductions and/or tax credits for employer efforts to promote ridesharing, transit, and other commute alternatives. (MTC, Air District, Congestion Management Agencies.)
- Elements of the *Spare the Air* program (see TCM 16). The Air District implements this program with assistance from the Bay Area Clean Air Partnership (BayCAP).
- Providing information and assistance to employers in organizing transportation fairs and other marketing events at Bay Area work sites. (MTC via the regional rideshare program, BAAQMD and transit agencies.)
- Working with employers to implement regional promotions such as Rideshare Week, Bike to Work Day, etc. (MTC via the regional rideshare program.)
- Working with employers to implement provisions of the State parking cash-out law, where employers who lease parking and meet other criteria must offer their employees

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the choice of "free" parking or the value of the parking space as a cash payment to use for commute alternatives, such as carpooling, transit, bicycling and walking, or to retain as additional income (see TCM 18).

- Promotion of the *Commuter Check* transit subsidy program to employers--see TCM 13. (MTC)
- Sub-regional or local programs to promote employer-based trip reduction in those cities and counties which choose to allocate local resources to such efforts. (Congestion Management Agencies, county transportation authorities, and BAAQMD via the *Spare the Air Cities* Program.)
- Cities, counties and other public agencies can participate by implementing programs to encourage their employees to use commute alternatives, including telecommuting, compressed work week schedules, guaranteed ride home programs, etc. (Public agencies.)
- Working with local law enforcement agencies and courts to include transit information with any notice to appear, in an effort to reduce driving by jurors, litigants, and especially unlicensed or uninsured drivers. (MTC via the regional rideshare program.)

### **Travel Market Affected**

This TCM targets commute travel, which accounts for approximately 25% of trips and 33% of VMT on a typical weekday.

### **Effectiveness**

Since this measure does not increase the current level of effort by local and regional agencies or the private sector, no emissions reductions are assumed beyond what has already occurred. However, without maintaining current efforts, drive alone commute trips would likely increase.

Empirical results show that employer trip reduction programs can decrease vehicle trips to a typical worksite by as much as 5-10 percent. Results from a 1996 BayCAP survey showed that work sites with voluntary trip reduction programs reduced commute trips by about 8 percent compared to the average for large work sites in 1994-95 before implementation of mandatory employer-based trip reduction. The survey also found that at least 15% and at most 60% of work sites are implementing voluntary trip reduction programs.

### **Cost**

The costs of this TCM include the public sector costs to provide services to promote voluntary employer efforts as well as the costs to employers which choose to implement such programs. Much of the public sector costs are included in the cost of funding the regional rideshare program (see TCM 14).

Employer costs depend upon the number of employers which implement voluntary programs and the specific services and incentives which they offer to their employees. Data from studies of mandatory trip reduction programs indicates that employer costs typically ranged from \$25 to \$100 per employee per year. It is expected that employer costs for voluntary programs will be lower, perhaps a maximum of \$40-\$50 per employee per year on average. It should be noted that net societal cost of voluntary trip reduction programs may be zero (or yield a net economic benefit), since employer costs are offset by savings to employees who benefit from services, subsidies, and incentives; to employers (e.g. reduced parking demand); and to society as a whole (reduced traffic congestion, energy consumption, and air pollution).

### **Impediments**

The primary impediments include limited funding for the regional rideshare program (see TCM 14), and reduced employer interest in trip reduction efforts in the absence of mandatory requirements.

## Other Impacts

In addition to reducing emissions, this TCM will reduce traffic congestion, fuel consumption, vehicle maintenance costs, roadway maintenance costs, water pollution and carbon dioxide (CO<sub>2</sub>) emissions.

## TCM 2 - EMPLOYER BASED TRIP REDUCTION

*(This TCM has been deleted. Senate Bill 437 (Lewis, 1995) does not permit air districts to require mandatory employer-based trip reduction programs. The text of this TCM is provided below for reference only as part of the 1997 CAP Triennial Progress Report.)*

### Purpose

The purpose of TCM 2 is to decrease motor vehicle emissions by reducing the use of single occupant vehicles for commuting to work sites and employment centers in the Bay Area.

### Background

Although Bay Area cities and counties began to adopt trip reduction ordinances to mitigate local traffic congestion in the mid-1980's, the California Clean Air Act created a specific link between employer-based trip reduction and air quality. The Act required air districts to adopt "reasonably available transportation control measures" as a necessary component of their control strategy to attain State ambient air quality standards. The Air Resources Board determined that employer-based trip reduction rules are a reasonable transportation control measure. The California Clean Air Act also established several transportation performance standards. As a "serious" ozone non-attainment area, the Bay Area is required to implement measures to achieve an average of 1.4 or more persons per passenger vehicle during weekday commute hours by 1999. In response to these mandates, the Bay Area Air Quality Management District (BAAQMD) adopted Regulation 13, Rule 1, Trip Reduction Requirements for Large Employers (the rule) in December 1992.

### Description

Regulation 13, Rule 1 applies to all employers at work sites with 100 or more employees. The rule divides the region into four geographic zones and establishes annual performance objectives for each zone. The performance objectives are expressed in terms of Vehicle Employee Ratio (VER). [Note: VER is the reciprocal of average vehicle ridership (AVR).] The performance objectives are phased; interim VER objectives are established for years 1993-1997, with final objectives effective in 1998. Failure to achieve the performance objectives is not a violation of the rule; it does trigger the requirement to submit an employer trip reduction plan.

The rule includes a provision that allows local jurisdictions (e.g. a city) to demonstrate that the final VER performance objectives are achieved on an aggregate basis for all applicable work sites within jurisdiction. Work sites in such jurisdictions are not subject to the specific rule requirements. The City and County of San Francisco has made such a demonstration.

The rule establishes the following administrative requirements: employer registration; designation of an Employee Transportation Coordinator (ETC) and an Employer Program Manager; employee notification; annual employee transportation survey; and development and implementation of an Employer Trip Reduction Program. In addition, employers that do not achieve the applicable performance objective are required to submit an Employer Trip Reduction Plan for review and approval. Employers have the option of submitting a conventional Employer Trip Reduction Plan or an Alternative Emission Reduction Program. The conventional Plan includes trip reduction measures to reduce the number of employees commuting to the work site in single occupant vehicles. An Alternative Emission Reduction

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Program achieves emission reductions through other means, such as a vehicle buy-back or scrappage program.

In addition to implementing the rule, the Air District will work to reduce commute trips to smaller work sites and employment centers that are not subject to Regulation 13, Rule 1. The Air District will pursue this via informational and outreach efforts directed toward smaller employers and employment centers (i.e. multi-tenant facilities). The Air District will also allocate AB 434 funds (the Transportation Fund for Clean Air), as appropriate, to projects and programs that benefit trip reduction efforts at smaller work sites. Current State law (SB 883) prohibits air districts from requiring employers of less than 100 employees to submit trip reduction plans. This law sunsets in 1997. The Air District will develop Regulation 13, Rule 2 to address employment centers and smaller employers in these centers in 1998.

### **Travel Market Affected**

TCM 2 focuses on commute travel, in particular commute travel during the morning and evening peak periods. On an average weekday, commute travel accounts for 25% of total vehicle trips, 33% of vehicle miles traveled, and 27% of on-road mobile source emissions in the Bay Area.

### **Implementation**

Regulation 13, Rule 1 became effective July 1, 1993 in Marin and Napa Counties. The rule became effective in other counties within the Air District on July 1, 1994. The Air District is implementing the rule, except in those areas where a local jurisdiction implements the rule via a delegation agreement with the Air District. As of April 1994, a total of 25 local jurisdictions expressed intent to seek delegation of the rule. These include all jurisdictions in Contra Costa County, as well as the cities of Alameda, Emeryville, and Pleasanton in Alameda County, San Francisco International Airport, the City of Fairfield, and Solano County (for work sites located in the unincorporated area of the county).

### **Effectiveness**

Achievement of the final performance objectives in the rule would raise the aggregate average vehicle ridership for all work sites subject to the rule from 1.3 to 1.43. This would decrease vehicle trips to affected work sites by 10 percent, eliminating approximately 168,000 vehicle trips per day. The rule is estimated to reduce the on-road mobile source emissions inventory by 1%. This will provide emission reductions of 1.6 tons per day of ROG, 1.7 tons per day of NO<sub>x</sub>, and 11.9 tons per day of CO based on the 1999 on-road vehicle emissions inventory. No emission reduction estimate is available for proposed efforts to reduce vehicle trips to smaller employers at employment centers.

### **Cost**

Costs to employers include administrative costs (salary and overhead for the ETC, survey processing, etc.) as well as the costs of services and incentives provided by the employer trip reduction program. Employer costs will vary, depending upon geographic location, proximity to transportation alternatives, the type of business and work force, and the measures that the employer chooses to include in its trip reduction program. Estimates of costs to comply with trip reduction requirements vary considerably. Data from southern California and Pima County, Arizona indicate that employers are spending between \$12 and \$86 per employee per year to comply with trip reduction regulations, with a median cost of \$70 per employee per year. Employers are eligible for various State tax credits and deductions for trip reduction measures, which can help to offset the costs of their trip reduction programs. Some employers may choose to fund their programs by imposing parking fees at the work site.

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## Other Impacts

In addition to reducing motor vehicle emissions, TCM 2 will help to reduce peak period traffic congestion and fuel consumption. Reducing vehicle trips will also decrease emissions of air toxics, carbon dioxide emissions (i.e. global warming), water pollution, and noise pollution.

Employees at affected work sites should benefit from enhanced commute options. Employees who switch from driving alone to a commute alternative will save money on fuel, vehicle depreciation and maintenance, tolls and parking. They will also benefit from decreased stress associated with driving in traffic. Employers also will realize benefits from trip reduction programs, including increased employee productivity, reduced absenteeism, longer retention of employees, and reduced demand for parking at the work site.

The rule will promote the implementation of alternative work arrangements, such as telecommuting and compressed work week schedules. Additionally, the rule will encourage employers to consider access to transit and other commute alternatives in locational decisions.

## TCM 3 - IMPROVE AREAWIDE TRANSIT SERVICE

### Purpose

This TCM will help to reduce motor vehicle trips, vehicle miles traveled, and mobile source emissions by maintaining and improving transit service, and by funding replacement of diesel buses with clean fuel buses.

### Background

The overall goal of the TCM plan is to reduce emissions from on-road motor vehicles. One key strategy is to shift vehicle trips to transit. Therefore, viable transportation alternatives to the private automobile must be provided. TCM 3 supports maintenance and improvement of the region's transit service. MTC's 1996 *Regional Transportation Plan (RTP)* projects that by maintaining bus systems and implementing a number of rail extensions, average weekday transit person trips will increase by 6.8 percent to 1.32 million between 1990 and 2015. However, no separate emissions reductions are attributed to the transit service part of TCM 3 since the ridership increase is largely due to enhanced rail service and rail extensions (see TCM 4).

During the past three years, the region was able to maintain and improve BART service. Caltrain increased weekday service to 66 trains in 1997. However, service levels of some Bay Area bus transit operators have declined, with MUNI, AC Transit and County Connection all cutting or reducing service. Nevertheless, the link between service levels and ridership is not clear, since operators have and do shift service to more productive routes and experience growth in ridership, despite a net reduction in service levels.

The only new bus transit services introduced to the region in the past three years were small peak-period shuttle buses operated by public transit districts connecting to rail stations, private firms providing specialized services for their clients and employees, or cities.

See TCM 4 for a discussion on new rail transit services.

The federal government continues to reduce operating subsidies to public transit. For this TCM to be fully implemented, transit services will need to be supported increasingly by local communities through growth in existing revenue or new revenues. Transit operators will also have to seek more productive use of their limited resources.

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The Air District funds replacement of diesel buses with clean fuel buses through the Transportation Fund for Clean Air. Clean fuel buses meet specified emission standards and do not use diesel as their primary fuel.

## Description

### Phase 1 (1998 - 2000)

- Maintain existing transit services and implement long-term transit improvements defined in MTC's 1996 *Regional Transportation Plan* and Transportation Improvement Program, particularly those that serve high density and mixed use areas. MTC will seek legislative changes to allow for more flexible use of transportation funds.
- The Air District will help fund the replacement of diesel buses with clean fuel buses.
- Improve transit access to airports, with a goal of capturing 50% of employee trips and 40% of passenger trips by the year 2000. (At the San Francisco Airport, transit usage (including car/van-pooling) would need to increase by 21.5% among employees and 11.5% among passengers.)

### Phase 2 (Beyond 2000)

- Increase local bus service if revenues become available, or better manage existing resources consistent with the transit districts' Short Range Transit Plans.

## Travel Market Affected

This measure should affect all intraregional travel, including commute travel, shopping, personal business, social and recreational travel, and school trips.

## Effectiveness

TCM 3 supports the transit program outlined in MTC's 1996 *Regional Transportation Plan* (RTP). As shown in the RTP, most of the region's resources over the next 20 years are expected to be utilized in operating and maintaining the current systems. Little expansion of bus systems is expected before the year 2000, and, at this writing, there are no new funds for transit operations. Estimated emissions benefits of rail expansion programs are shown under TCMs 4, 5 and 6. While TCM 3 is critical to **maintaining** air quality, no additional air quality emission reductions are assumed for expanded transit service until new transit operating revenues are identified. Funding for clean fuel buses through the Air District's Transportation Fund for Clean Air should yield the following emissions reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.01 tpd	0.01 tpd
2015	<0.01 tpd	0.01 tpd

## Cost

The cost to maintain transit systems over the next 20 years is estimated at \$9.4 billion in capital needs and \$33.4 billion in operating needs. The Air District has granted approximately \$250,000 per year for clean fuel transit buses. The above emissions reductions assume maintenance of this level of funding; however, the Air District hopes to significantly expand funding for clean fuel transit buses during 1998-2000.

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## **Impediments**

Implementation of TCM 3 will require that existing sources of transit funding be maintained consistent with assumptions in MTC's 1996 *Regional Transportation Plan*. As noted above, expansion of service requires continued growth in existing operating funds, or new operating funds, which are currently not available from traditional State and federal resources. MTC will seek additional legislative authority for "flexible" use of traditional transportation funds; however, to maintain current service levels, it will be necessary to identify new or expanded sources of operating funds.

## **Other Impacts**

Other benefits include reduced need for additional road capacity, savings on wear and tear on both roadways and motor vehicles, reduced water pollution, and improved quality of life for Bay Area residents due to improved transportation options.

## **TCM 4 - EXPEDITE AND EXPAND REGIONAL RAIL AGREEMENT**

### **Purpose**

This TCM will reduce motor vehicle trips, vehicle miles traveled and mobile source emissions by promoting rail extensions and/or upgrades on the BART, MUNI, Tasman light rail and CalTrain systems. It will also promote the development of new light rail service in the East Bay and North Bay. This TCM will be most effective if implemented in conjunction with rail station area plans that provide for high density and mixed use development in the immediate vicinity of stations.

### **Background**

This TCM focuses on a set of rail improvements that have been agreed to as the highest regional priorities. Phase 2 improvements are based upon MTC's 1996 Regional Transportation Plan and MTC's New Rail Starts Program.

There are no Phase 1 extensions mentioned below since all previous Phase 1 extensions have either been completed or will be completed by mid-1997. Phase 2 extensions below will likely not be delivered until after the year 2000.

This TCM has been expanded in scope to include all potential or planned rail improvements that will facilitate movement within the region, rather than focusing only on projects in MTC's Resolution 1876 (New Rail Starts Program). An initial list of projects is provided below as Phase 3. This list will need to be modified once MTC adopts its Track 2 program as part of the 1998 *Regional Transportation Plan* (RTP).

### **Description**

#### **Phase 2 (2001-2003)**

- Bayshore Corridor Extension of Third Street Light Rail from downtown San Francisco to Hunters Point
- Extension of CalTrain to downtown San Francisco
- Extension of Tasman light rail system in Santa Clara: East and West extensions
- BART to San Francisco International Airport (4 stations)

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### Phase 3 (Beyond 2003)

- Light rail service on East 14th Street, San Pablo Avenue, Telegraph Avenue and Foothill Boulevard in the East Bay
- Additional light rail service in Santa Clara County
- Peak period and weekend service on the Northwest Pacific route between Santa Rosa and Larkspur
- Peak period commuter service between Vacaville and Oakland
- Fremont-South Bay rail connection (Voters in Santa Clara passed a measure to continue their 0.5% sales tax for transportation projects. This tax includes \$50 million for the start of commuter rail service from Union City BART to downtown San Jose.)

MTC is working with BART, CalTrain and Santa Clara Valley Transportation Authority to implement the New Rail Starts program. Funding for the New Rail Starts program is based upon a combination of Federal aid, state funding, and local sales tax revenues. Federal funding for the extension to San Francisco International Airport is critical to the financing plan for the entire package of BART extensions.

The current schedule calls for completion of the BART extension to San Francisco International Airport (SFO) in 2002 if federal funds continue to be authorized. A "Full Funding Agreement" was obtained for this project in 1997. Extension of the Tasman West Light Rail project is scheduled for completion by December 2000, while the Tasman East project will be constructed sometime after 2000. The locally funded Bayshore Light Rail project is scheduled for a 2003 opening.

The CalTrain extension to downtown San Francisco has been studied as part of an incomplete Federal Environmental Impact Statement. Its implementation cannot take place until the development of a financing plan. Decisions in 1997 by the City and County of San Francisco have jeopardized this important project. City officials do not want to fund completion of environmental studies or provide local funding for the project. Light rail service in the East Bay was studied as part of AC Transit's Alternative Modes Analysis. Ridership in several corridors is strong enough to support light rail; however, no funding has been identified. Light rail between Larkspur and Santa Rosa is currently under study as an option for relieving congestion in the 101 Corridor. When developing the 1998 *Regional Transportation Plan*, MTC will analyze the viability of current and proposed rail extensions in the region, to ensure that planned service has adequate ridership and reasonable costs.

### Travel Market Affected

This measure would affect all types of intraregional travel, including commute travel, shopping, personal business, social and recreational trips, school trips, and travel to San Francisco International Airport.

### Effectiveness

TCM 4's Phase 2 improvements are expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.08 tpd	0.08 tpd
2015	0.06 tpd	0.07 tpd

Emissions reductions have not been quantified for Phase 3 improvements.

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The effectiveness of TCM 4 in reducing vehicle travel and emissions depends in part upon market-based transportation pricing and success in developing land use policies that complement transit, such as zoning policies that encourage denser development in the vicinity of transit stations (see TCM 15).

### **Cost**

Most of the funding for Phase 2 is available through existing funding sources. If legislation is approved for TCM 18 - Revenue Measures, a portion of this additional revenue could be used to accelerate construction of the rail extensions in Phase 2.

### **Impediments**

Full funding has not been appropriated for the extension of BART to San Francisco International Airport, Caltrain to downtown San Francisco, the Fremont-South Bay rail connection, the East Bay light rail projects and service between Larkspur and Santa Rosa. Furthermore, even if funding is obtained for the Caltrain extension, local support is tenuous. Additional light rail projects in Santa Clara County will depend on court validation of their simple majority sales tax referendum.

### **Other Impacts**

In addition to reducing emissions, MTC's Resolution 1876 projects are expected to yield \$44 million per year in travel time savings by reducing traffic congestion. Other benefits include reduced need for additional road capacity, reduced wear and tear on both roadways and motor vehicles, reduced water pollution, and improved quality of life for Bay Area residents due to improved transportation options.

Although TCM 4 will improve the region's overall air quality, it may have negative impacts on a localized basis if not implemented with adequate mitigation measures. Emissions due to construction may cause a short-term negative impact on air quality. Also, motor vehicle trips to the new transit stations may increase local carbon monoxide levels in some areas. Mitigation of the latter impact can be achieved through measures that promote the use of walking, bicycling, and shuttle buses to access transit stations (e.g., TCM 5).

## **TCM 5 - IMPROVE ACCESS TO RAIL AND FERRIES**

### **Purpose**

TCM 5 will reduce motor vehicle trips, vehicle miles traveled and mobile source emissions by improving bus, bicycle and pedestrian access to rail and ferry systems. This measure will complement TCMs 3, 4, 6 and 7.

### **Background**

The Bay Area is committed to maintaining and improving transit service at a cost of several billion dollars. Supporting measures that promote access to transit are needed to ensure that the region gets full return on this large investment.

From the standpoint of air quality, it is critical to reduce motor vehicle trips. Because of "cold starts" generating a large part of a vehicle trip's emissions, much of the potential air quality benefit is lost if transit patrons drive to the station. For this reason, emphasis should be placed on access improvements that promote alternatives to the automobile wherever this approach is feasible.

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A vast majority of rail patrons live within 1-2 miles of the rail station. Even though most transit patrons live within easy biking distance, only 1% of BART riders currently access the station by bike. CalTrain has seen an increase in ridership due to providing increased carrying capacity for bikes -- bicycle riders now account for at least 5% of total ridership. Because bicycle and pedestrian improvements are more cost-effective than building and maintaining auto parking, efforts to increase bicycle parking and improve pedestrian access to major transit stations should be undertaken.

### **Description**

TCM 5 provides for significant improvements in rail and ferry access through the following strategies:

- Improve bicycle access (e.g. bike paths, adequate curb lane widths for bicycles on roadways, storage facilities)
- Improve pedestrian access to rail stations
- Encourage BART and CalTrain to provide preferential parking for electric vehicles
- Support improved local and express feeder bus services to rail and ferries consistent with routes specified in Short Range Transit Plans
- Improve timed bus transfers from residential areas to train stations and from train station to employment sites

Implementation of TCM 5 will require cooperation between MTC, the Air District, bus and rail operators, and the private sector (employers, developers, etc.).

MTC will allocate funds under its control consistent with the Regional Transportation Plan and operators' Short Range Transit Plans.

The Air District's Transportation Fund for Clean Air (TFCA) accepts public agency applications for improving bicycle and pedestrian access, and local feeder bus or shuttle service to rail and ferry systems. These projects may also be funded with TFCA directly by county Program Managers. The Air District's Transportation Fund for Clean Air funds several shuttle projects currently operating in the Bay Area. The amount of TFCA funds allocated to these routes decrease over time and there is no guarantee these routes will continue to receive TFCA funding in the future. Efforts should be made to capture and retain the transit market created by these shuttle routes. The Air District will work with transit operators to develop TFCA applications for new shuttle and feeder bus service to rail and ferry stations that reduce emissions.

### **Cost**

Total cost in 1991 was estimated at \$50 million per year to subsidize services that provide improved timed-transfer access to mass transit.

### **Effectiveness**

TCM 5 is expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.04 tpd	0.03 tpd
2015	0.03 tpd	0.03 tpd

### **Impediments**

Full implementation of TCM 5 will require maintenance of existing revenues sources and approval of legislation to provide new revenue (see TCM 18).

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## **Travel Market Affected**

TCM 5 will affect all types of trips, including commute travel, shopping, personal business, social and recreational travel, and school trips.

## **Other Impacts**

In addition to reducing emissions, TCM 5 benefits include reduced fuel consumption, reduced water pollution, reduced wear and tear on motor vehicles and roadways, and enhanced transportation options for residents of the Bay Area.

Although TCM 5 will improve the region's overall air quality, it may have negative impacts on a localized basis. There are potential impacts due to an increase in vehicle trips around transit stations from expanded feeder and shuttle bus service. Potential impacts would be mitigated by promoting the use of clean fuel buses and by emphasizing access improvements that promote alternatives to the private automobile. Increased bus traffic and emissions around rail and ferry stations should be completely offset by a reduction in single occupant vehicle usage.

## **TCM 6 - IMPROVE INTERREGIONAL RAIL SERVICE**

### **Purpose**

TCM 6 will reduce motor vehicle travel and mobile source emissions by providing regular interregional rail service in the Roseville-Sacramento-Oakland-San Jose (Capitol) corridor, the Oakland-Stockton (San Joaquin) corridor, and new rail services in the South, East and North Bay areas.

### **Description**

In the 1994 CAP, this TCM consisted entirely of improvements to the rail corridor between San Jose and Roseville (Capitol Corridor). Increasing Capitol Corridor service from four to ten daily round trips continues to be part of this TCM. This TCM now includes a trial period of service in the corridor between Stockton and San Jose, and new or expanded service in three additional corridors.

In July of 1996, Governor Wilson signed into law SB 457. This bill, sponsored by Senator Kopp, turned over control of the Capitol Corridor to a joint power board (CCJPB). This new agency is governed by a Board made up of representatives from BART, Sacramento Transit, Santa Clara Valley Transportation Authority, and local government representatives. Management of the service moved from Caltrans to BART for a minimum of three years. The CCJPB has met, but has not announced any plans regarding the Capitol Corridor. However, track and station improvements along the corridor continue, and MTC's *Regional Transportation Plan* includes an upgrade of service from its current four trains per day to six trains per day. The current operations plan calls for the addition of a fifth train in FY 1997-98 and a sixth train by FY 1998-99. The long range goal of ten round trips should be retained, with consideration given to extending service to Reno on a limited number of trains.

New commuter rail service from Stockton to San Jose is planned to begin by Spring 1998. The service will initially be two peak hour trains over the Altamont Pass and through Niles Canyon. If the commuter service is successful, service will continue and an additional train will be added in Phase 2.

The remaining corridor services have been studied. These may help meet future travel demand. However, funding for the service is unlikely until well beyond 2000.

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### **Phase 1 (1998-2000)**

- Increase Capitol Corridor service from four to six daily round trips
- New trial commuter service between Stockton and San Jose (Altamont Pass Demonstration Project)

### **Phase 2 (2001-2003)**

- Increase Capitol Corridor service from six to ten daily round trips

### **Phase 3 (Beyond 2003)**

- Expansion of Amtrak's San Joaquin service between Stockton and Oakland
- New commuter service between Santa Cruz and San Jose
- New daily service between the Bay Area and Eureka
- Consideration of High Speed Rail between the downtowns of San Francisco and Los Angeles (a plan for service was recently adopted by the High Speed Rail Commission)

### **Travel Market Affected**

TCM 6 will affect both interregional travel to and from the Bay Area, and intraregional travel in many corridors.

### **Effectiveness**

TCM 6's Phases 1 and 2 improvements are expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.02 tpd	0.03 tpd
2015	0.02 tpd	0.03 tpd

Emissions reductions for the Phase 3 improvements have not been quantified.

### **Cost**

Funding for capital costs to upgrade Capitol Corridor service to 6 daily round trips is pending State budgetary discussions and commitments. Funding for the Altamont Pass Demonstration project is committed for the initial year of service. No local (Bay Area) ongoing operating funds are identified for this service.

### **Impediments**

Obstacles to maintaining current Capitol Corridor service levels and adding additional service all relate to ensuring state funding continues. Long-term continuance of the Altamont Pass Demonstration Project depend upon the how the public responds to the initial demonstration service.

### **Other Impacts**

TCM 6 will provide transportation alternatives between the Bay Area and neighboring regions of the State. This will help to reduce congestion. Travel time savings for six round trips on the Capitols was estimated at \$2.5 million per year. Additional benefits include reducing fuel consumption, vehicle wear and tear/depreciation, highway maintenance costs, water pollution and carbon dioxide emissions.

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## TCM 7 - IMPROVE FERRY SERVICE

### Purpose

TCM 7 will reduce motor vehicle travel and mobile source emissions by expanding transbay ferry service.

### Background

Freeways and bridges that connect the East Bay and the North Bay to San Francisco are heavily congested. High speed ferry service offers a transportation alternative that is efficient, comfortable and high in aesthetic appeal.

### Description

TCM 7 contains several elements:

#### Phase 1 (1998-2000)

- Continuation of post-earthquake ferry service between Oakland/Alameda and San Francisco
- Expansion of service between Vallejo and San Francisco
- Expansion of service between Larkspur and San Francisco
- Continuation of service between Harbor Bay Isle (Alameda) and San Francisco (private operator)
- Feeder bus service to provide access to ferries (see also TCM 5)
- Expand carrying capacity for bicycles on ferries (see also TCM 9)

#### Phase 3 (Beyond 2003)

- Potential new service between Port Sonoma and San Francisco (private operator)
- Potential new service for passengers and cargo between Oakland and San Francisco airports

MTC prepared a regional ferry service plan as required by SB 2169 (Kopp, 1992). MTC will allocate funds under its control consistent with the long range ferry plan and the 1996 *Regional Transportation Plan*. Vallejo has ordered two new boats and will increase peak period service to San Francisco from one trip per day to three. The Golden Gate Bridge, Highway and Transportation District has funding programmed for an additional Larkspur ferry, and will use this new boat to increase the number of round trips per day between Larkspur and San Francisco. The additional service is scheduled to begin by early 1998.

Funding for continued service between Oakland/Alameda and San Francisco is through bridge tolls allocated by MTC and local funding from the City of Alameda and Port of Oakland.

A private developer has proposed to initiate high speed ferry service from Port Sonoma (near Novato) to San Francisco or to the San Francisco Airport; however, funding and other issues will have to be resolved. MTC has worked with ferry and other transit operators to develop transfer arrangements, including low cost transfers and joint passes (see TCM 13).

### Travel Market Affected

This measure will focus primarily on peak period commute travel, when congestion on bridges is greatest. It will also provide an additional transportation option for shopping, personal business,

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and social and recreational trips. Expanded midday ferry service may also help accommodate additional tourist trips.

### **Effectiveness**

TCM 7's Phase 1 improvements are expected to yield the following emission reductions:

	<u>ROG</u>	<u>NO<sub>x</sub></u>
2005	0.01 tpd	0.01 tpd
2015	<0.01 tpd	0.01 tpd

Emissions reductions for Phase 3 have not been quantified.

### **Cost**

Most of TCM 7 is already funded. If transportation pricing reform legislation is approved, additional funding could be allocated to fully implement TCM 7.

### **Impediments**

Major impediments include ensuring that operating funding is maintained.

### **Other Impacts**

By helping to reduce traffic congestion, TCM 7 is expected to reduce fuel consumption, wear and tear on motor vehicles, water pollution and highway maintenance costs.

Expansion of ferry service will enhance the Bay Area's transportation system by providing a transportation option that is both practical and high in aesthetic value. A regional ferry system may help to stimulate the tourist industry throughout the region and provides a transportation alternative during emergencies such as earthquakes.

## **TCM 8 - CONSTRUCT CARPOOL / EXPRESS BUS LANES ON FREEWAYS**

### **Purpose**

This TCM could help reduce mobile source emissions in the near term by promoting the use of carpools, vanpools and other high occupancy vehicles (HOVs) such as express buses, provided the operational recommendations outlined below are implemented.

### **Background**

Low vehicle occupancy rates are a major cause of the Bay Area's mobile source related air pollution and traffic congestion problems. The single occupant vehicle is the dominant mode of transportation, especially during peak commute periods, when over 68% of cars and trucks carry only the driver (Source: 1990 Census). Travel time and cost are the primary factors that influence choice in transportation mode. Although carpools and vanpools can provide a significant cost saving compared to driving alone, they often involve a sacrifice in terms of time required for pick-up and drop-off. By providing a significant time savings for carpools, vanpools and express buses, additional 3-person HOV lanes on key freeways and expressways may stimulate formation of carpools and use of high occupancy vehicles. Maximum priority should be given to HOV system enhancements that give priority to buses, and reduce their travel time. Since expressways are open to bicycle travel, the addition of HOV lanes should avoid hazards to bicycle users.

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The California Air Resources Board has defined HOV lane networks as a "reasonably available" transportation control measure under the provisions of the California Clean Air Act. The Act mandates that local air districts include all reasonably available TCMs in their air quality plans.

## Description

MTC issued a *Year 2005 HOV Lane Master Plan* in August 1990, which was prepared in cooperation with Caltrans and the California Highway Patrol. This Master Plan provides a blueprint for construction of additional HOV lanes in the region. The Master Plan calls for a network of 534 lane-miles of HOV lanes upon completion compared to 270 lane-miles at present. However, MTC is in the process of updating the Master Plan, and envisions a more limited HOV system of 419 lane-miles.

Several events have occurred that necessitate an update of the Master Plan. While many of the HOV lanes have been constructed and are operational, others have been dropped from funding consideration. In addition, in response to ISTEA, MTC has developed a financially constrained 1996 *Regional Transportation Plan* (RTP) that does not include a number of HOV lanes identified in the Master Plan that have no current funds available for construction.

A HOV lane system designed to improve air quality would have the following elements:

- Identification of freeway segments where conversion of general purpose lanes to HOV lanes would provide significant time savings for transit, allow projects to be implemented earlier or avoid entirely the cost and dislocation associated with freeway widenings.
- Joint planning with transit agencies and major employers in the HOV corridor regarding design, operations and promotion of the HOV facility
- Active enforcement of occupancy and use restrictions (to reduce violation rates that today run as high as 20 to 30 percent), and identification of long term funding for enforcement.
- Direct connections between HOV lanes on intersecting freeways
- "Slip ramps" allowing direct entry and exit to HOV lanes at key points along freeways
- HOV Bypass lanes at metered ramps allowing additional time advantage to carpoolers
- Strategically located park & ride lots for HOV lane users
- Aggressive rideshare promotion/matching in a corridor
- Changeable message signs and real time information to provide information on HOV lanes (entry points, hours of operation, occupancy requirements, etc.)
- Clean fueled vehicles should be allowed to use HOV lanes regardless of their occupancy. This access could be granted only to zero emission vehicles (ZEVs), or alternatively could also be granted to inherently low emission vehicles (ILEVs). While air quality benefits would be maximized by providing access to all ILEVs, the idea may be more politically feasible if it applies only to ZEVs. This is because the very low number of ZEVs on the road initially means that they should not contribute significantly to HOV lane congestion. Such an HOV access provision should be designed to sunset at either some future year (e.g., 2003) or at a fixed level of ZEV/ILEV sales volume. Vehicles eligible to use the HOV lanes regardless of occupancy should be required to be identified in some obvious way to simplify enforcement. This strategy would provide a very powerful incentive to spur sales and introduction of clean fueled vehicles, without cost to the state or region.

MTC and Caltrans will conduct corridor studies to help determine the need for support facilities described above. MTC will coordinate with Caltrans on specific proposals with respect to their design feasibility and potential for funding.

Funding varies by project, and can include Federal, State and local moneys. Approximately 139 HOV lane miles are programmed in the *1997 TIP*.

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Increases in certain express bus services should be considered to maximize person carrying capacity of HOV lanes. MTC is currently reviewing express bus service needs which would be operated on HOV lanes in the I-80 corridor.

Average vehicle occupancy of all HOV lanes should be monitored frequently. HOV lane use requirements (currently 2 persons for most HOV lanes) should be increased to 3 people per vehicle when appropriate to maintain travel time advantages and stimulate the formation of new carpools.

Hours of operation could be extended from the current a.m. and p.m. peak periods to cover mid-day hours (10:00 a.m. to 3:00 p.m.) where mid-day congested conditions warrant. This would provide greater benefits to HOVs and enhance transit reliability where transit operates on HOV lanes.

### **Travel Market Affected**

TCM 8 is aimed primarily at commute trips, which account for the majority of trips during the morning and evening peak periods. However, HOV lanes should help to increase average vehicle occupancy for other types of trips (shopping, personal business, school, recreational), especially when lane designation is expanded to include mid-day periods.

### **Effectiveness**

TCM 8 is expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.01 tpd	0.01 tpd
2015	0.03 tpd	0.03 tpd

### **Cost**

Funding for partial construction of the *HOV Lane Master Plan* is already available through several sources, including ISTEA, Proposition 111 and local county sales tax measures. If legislation is approved for new revenue measures (see TCM 18), a portion of this new revenue could be allocated to expedite construction of the HOV lanes.

### **Impediments**

Funding must be maintained as assumed in the 1996 *Regional Transportation Plan* to complete the remaining 56 lane miles identified in the Regional Transportation Plan.

### **Other Impacts**

In addition to reducing emissions in the near term, TCM 8 will help to mitigate traffic congestion. An additional benefit is reduced wear and tear on motor vehicles.

Construction of HOV lanes will create employment in the construction trades over the next 10-15 years.

TCM 8 may have a short term negative impact on air quality due to emissions generated during construction. Congestion on freeways and adjacent arterials can be expected during construction. However, traffic mitigation programs for certain major projects can be implemented to mitigate congestion.

TCM 8 may also have a long term (i.e., 20 to 50 years from today) negative impact on air quality due to additional traffic being attracted to the highway, generated by increased land development in the areas served by the HOV facility. This phenomenon is particularly an issue in rapidly

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developing areas of Contra Costa, Santa Clara, Solano and Sonoma counties, where new development may quickly consume added capacity and return facilities to their pre-HOV lane congestion levels. The Air District has asked that the Air Resources Board consider whether HOV lanes should remain on the list of reasonably available TCMs. Air District staff will follow research on this topic and adjust future air quality plans accordingly.

## **TCM 9 - IMPROVE BICYCLE ACCESS AND FACILITIES**

### **Purpose**

TCM 9 will reduce motor vehicle travel and mobile source emissions by promoting the expansion of bicycle facilities including, but not limited to, bike lanes, routes, paths, and bicycle parking facilities, and by increasing bicycle access to buses, trains, and across bridges, and to maintain a roadway system that is safe for bicycle travel.

### **Background**

Bicycles are a widely available, pollution-free transportation mode. They are well suited to short and medium range trips, as well as an excellent means of access to transit stations. Bicycles can play a significant role in helping to reduce the high cold-start emissions associated with short vehicle trips. According to the 1990 Nationwide Personal Transportation Study, 40% of all trips are two miles or less, and two-thirds are five miles or less.

Although bicycles are widely used for recreational riding, they are currently under-utilized for commute trips and other utilitarian travel. While one-third (33.8%) of Bay Area employees live within five miles of their worksite, only one percent of Bay Area residents use a bicycle as their primary commute mode (1990 Census data).

One key reason for this low level of usage is that bicycles are poorly served by the existing transportation infrastructure, which is designed to accommodate motor vehicles. In a 1991 Harris poll, more than 20% of adult Americans said that they would sometimes commute by bicycle if safe bicycle lanes or paths were provided.

Experience in cities such as Palo Alto, Davis, Seattle, and Portland, Oregon shows that bicycles can play an important role in local transportation. The improvements in access and facilities in TCM 9 should enable bicycles to play a greater role in the overall regional transportation system.

### **Description**

A comprehensive effort to increase bicycle travel must include better planning practices to integrate bicycles into roadway improvement or construction projects, physical roadway improvements to accommodate bicycles, improved facilities and policies to promote bicycle access to transit, and a recognition by public agencies and motorists that bicycles are a legitimate element in the regional transportation system. Bicycle improvements in TCM 9 include:

- The Air District and MTC will, and Caltrans and local jurisdictions should help fund and expand the system of local and regional bike routes, lanes and paths to serve activity centers such as employment sites, educational and cultural facilities, and shopping districts.
- Caltrans and local jurisdictions should provide bicycle access in planning for all new road construction or modifications. All road construction or reconstruction on which bicycles and/or pedestrians are permitted should be designed and constructed so as to provide appropriate accommodations for these users. When a transportation project or regulatory action is undertaken that reduces accessibility by bicycle or on foot, or renders conditions for non-motorized users less safe, equal or better access should be provided by other improvements as part of the same project.

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- Cities and counties should develop and implement local bicycle plans.
  - Caltrans and local jurisdictions should provide adequate curb lane widths for bicycles on roadways.
  - Caltrans and local jurisdictions should provide signage to ensure that motorists understand and respect the need to share the road with bicyclists and to encourage bicycle travel.
  - Caltrans should permit bicycles on freeway shoulders where no adequate alternative route exists.
  - Caltrans and local jurisdictions should ensure that bicycle right-of-way is preserved or enhanced in roadway expansion or modification projects, in order to maintain or improve the level of safety for bicycle travel.
  - Caltrans and local jurisdictions should adjust signal equipment and provide pavement marking so that bicyclists know where to stop in order for the traffic signal to change when motor vehicles are not present.
  - Caltrans should provide access for bicycles across all existing Bay bridges, including the San Francisco - Oakland Bay Bridge, and will provide direct access for bicycles on any new or modified bridge construction.
  - Where feasible, transit agencies should expand carrying capability for bicycles on buses, ferries and rail systems during both peak and off-peak periods, and include information on bicycle access in their advertising and promotional materials.
  - Transit agencies should provide an adequate supply of secure bicycle parking at all transit stations.
  - Local jurisdictions and transit agencies should investigate the concept of providing "station bikes" for use at high-volume transit stations.
  - Local jurisdictions, developers, and employers should work together to provide secure bicycle parking at worksites and other activity centers, and at residential complexes where units do not have secure garage space. The Air District will develop model policies for local governments regarding bicycle access and facilities, such as bicycle parking requirements.
  - Local jurisdictions, developers, and employers should work together to incorporate bicycle access, facilities and amenities, into the site design for new developments and at residential complexes (see TCM 15). Non-residential projects should have showers and lockers provided for employees who wish to commute by bicycle.
  - Local agencies and school districts should promote bicycle safety, including public education for both bicyclists and motorists. The promotion will emphasize the "Share the Road" concept, bicycle safety courses for school children, and safe bicycle routes to schools. Education for school children should include:
    - bicycle and pedestrian safety presentations
    - bicycle rodeos (elementary schools)
    - on road bicycle education, based on the effective cycling model
  - MTC, as part of its contract for ridesharing services, will continue to offer public information on bicycling and specify that contractors continue to develop educational and promotional materials. Such materials help create a climate conducive to bicycle commuting.
  - MTC will continue to require local jurisdictions to form and maintain Bicycle Advisory Committees, and to develop comprehensive bicycle plans as a condition for receiving TDA funds.
  - The UC Berkeley Institute of Transportation Studies should continue to provide extension courses on bicycle facilities planning for local transportation planners and engineers.

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## Travel Market Affected

TCM 9 will promote bicycle use (or bicycles combined with transit) for the entire range of local trips, including commuting, shopping, personal business, and social and recreational travel. The potential market for TCM 9 is significant, given that short distance trips of less than five miles account for the majority of all trips in the region.

TCM 9 sets a goal of achieving a 2% bicycle commute mode share by 2000, compared to approximately 1.6% in 1996, and a 5% mode share by 2010.

## Effectiveness

TCM 9 is expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.05 tpd	0.03 tpd
2015	0.07 tpd	0.05 tpd

## Cost

Transportation Development Act (TDA) funds of about \$3 million per year are currently available for bicycle improvements. MTC's 1996 *Regional Transportation Plan* includes \$43 million over the next 20 years in funding for bicycle and pedestrian facilities. The Air District's Transportation Fund for Clean Air also funds bicycle improvements. If a regional gas tax is approved (see TCM 18), funding should be made available to fund additional bicycle improvements. Federal funding may be available for bicycle projects, depending upon the outcome of the ISTEA reauthorization in Congress and the fate of the ISTEA Transportation Enhancements fund. Dedicated funding for bicycle projects is limited. Many bicycle improvements can be incorporated into regular roadway maintenance or improvement projects.

## Impediments

Full implementation of bicycle improvements is contingent upon approval of legislation to provide additional revenues to fund mobility improvements (see TCM 18). Increased bicycle access on transit, especially during peak periods, may require operational adjustments of transit operators and additional capital equipment. If Senate Bill 367 (Sher, 1997) does not become law, the Air District will no longer be able to fund bicycle improvements. (SB 367 would allow the Air District to fund bicycle improvements for two additional fiscal years, FY 98/99 and FY 99/00.)

## Other Impacts

In addition to improving air quality, TCM 9 will help to reduce energy consumption, traffic congestion, and water pollution. Benefits in travel time savings are estimated at \$1.4 million per year. Since bicycles are an excellent means of exercise, TCM 9 will also promote public health. Other impacts include reduced motor vehicle depreciation and roadway maintenance costs, and less need for parking at new developments.

## TCM 10 - YOUTH TRANSPORTATION

### Purpose

TCM 10 is designed to reduce motor vehicle travel and mobile source emissions related to the transportation of youths and students.

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## Background

Youth and students have special transportation needs. Because they have limited access to motor vehicles, they depend upon public transit, bicycles, walking, and being driven by adults.

Due to funding constraints, a number of school districts in the Bay Area are no longer able to operate school bus services.

## Description

TCM 10 will improve youth and student mobility, and reduce vehicle trips by:

- Encouraging walking and bicycling to school
- Encouraging carpooling among high school students with cars (e.g., the Rides to School Program)
- Establish special carpool formation services for parents, students and staff at Bay Area elementary and secondary schools
- Support transit ride discounts to youth and students (e.g., youth pass programs)

TCM 10 will also reduce emissions by encouraging the conversion of school buses to clean fuels. Funding for this activity can be provided by the Transportation Fund for Clean Air.

Full implementation is contingent upon approval of legislation for transportation pricing reform (see TCM 18).

MTC will allocate funds to transit operators, who, in turn, generally provide discounts to student riders.

The Air District and MTC will work with entities such as RIDES and school districts to promote carpooling for high school students with cars and among parents, students and staff at Bay Area elementary and secondary schools, as well as programs that encourage students to walk or bicycle to school..

## Travel Market Affected

According to MTC travel data, school trips account for 2-3% of total vehicle miles traveled in the Bay Area. TCM 10 would address this market, as well as youth travel outside of school hours.

In addition to its direct impact on school trips, TCM 10 may also have an impact on commute trips. If additional school bus service is provided, parents who must now drop off their children at school while in route to work might be able to commute via ridesharing or transit.

## Effectiveness

TCM 10 is expected to yield the following emission reductions:

### *Clean Fuel School Buses*

	<u>ROG</u>	<u>NO<sub>x</sub></u>
2005	0.01 tpd	0.04 tpd
2015	0.01 tpd	0.03 tpd

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### Other

	<u>ROG</u>	<u>NOx</u>
2005	0.02 tpd	0.01 tpd
2015	0.03 tpd	0.03 tpd

### Cost

The Air District has granted approximately \$1,900,000 per year for clean fuel school buses. The emissions reductions shown above for clean fuel school buses assume maintenance of this level of funding.

### Impediments

Full implementation of this measure depends upon additional funding, such as approval of transportation pricing reform legislation.

### Other Impacts

In addition to reducing emissions, TCM 10 will mitigate traffic congestion. Other benefits include reduced fuel consumption and wear and tear on motor vehicles and roadways, as well as less demand on parents to provide private transportation for their children. Water pollution will also be reduced.

## TCM 11 - INSTALL FREEWAY/ARTERIAL METRO TRAFFIC OPERATIONS SYSTEM (MTOS)

### Purpose

TCM 11 will reduce congestion-related emissions in the short term by improving the flow of traffic on the regional transportation network.

### Background

Congestion worsens motor vehicle emissions. Much of the regional freeway network already operates at or above capacity during peak periods, and congestion is expected to increase substantially in future years, even with planned increases in capacity. Operational improvements could be a cost-effective means to improve the efficiency of the regional transportation system, but may not reduce vehicle emissions over the long run.

### Description

Caltrans and local agencies' Metro Traffic Operations System (MTOS) includes multiple operational strategies such as traffic advisory signs, ramp metering, traffic surveillance by closed circuit TV and traffic data collection. In addition, this TCM includes other freeway operational strategies being implemented by MTC and Caltrans such as TravInfo (transportation advisory information on radio, television, telephone and the Internet), and tow truck incident management to eliminate traffic tie-ups more quickly. Components of the system are identified in the Partnership's *Metropolitan Transportation System Management Strategy* (available from MTC).

Federal TCM 26 assumed completion of Caltrans' MTOS on 45 miles of freeways that provide linkages with the Bay Bridge (portions of I-80, I-280 and Route 101 in San Francisco, and I-80, I-580 and I-980 in Alameda County), and ramp metering on 20 miles of I-880 from Oakland to Fremont. Certain components of these MTOS projects are operational today, and are expected to be fully operational in 1999. Full implementation of the MTOS will cover approximately 450 miles of the Bay Area's freeways.

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MTC and Caltrans have implemented Freeway Service Patrols on 218 miles of freeways to limit the impacts of vehicle breakdowns on freeway congestion, and funding has been identified for an additional 15 miles of freeway.

### **Travel Market Affected**

TCM 11 will address all categories of vehicle trips, including inter-regional and commercial travel, as well as commute trips, shopping recreation, personal business, etc.

### **Effectiveness**

TCM 11 is expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.10 tpd	0.01 increase
2015	0.14 tpd	<0.01

TCM 11 is expected to yield short term reductions in both ROG emissions and vehicle hours of delay. However, by reducing congestion, this measure is expected to increase vehicle trips, VMT and average speed. Depending on the extent to which this TCM induces new trips, it may not be beneficial for air quality. Each corridor should be examined in detail for air quality impacts prior to project implementation.

### **Cost**

Cost and funding requirements for MTOS are being refined at this time. TravInfo initial startup costs of \$8 million are funded through September 1998. Freeway Service Patrols are funded through a \$1 fee on vehicle registrations.

### **Impediments**

Implementation of Phase 2 of MTOS will require fully defining all components of MTOS and their costs. Implementation will be provided for in the 1998 *Regional Transportation Plan*.

Funding for TravInfo is in place for the Phase I operational phase (through September 1, 1998). Funding will have to be secured for the period after September 1998.

### **Other Impacts**

In addition to providing short term ROG emission reductions, TCM 11 should reduce traffic congestion and vehicle hours of delay.

It should be noted that although most TCMs cause reduced vehicle trips and vehicle miles traveled, TCM 11 is expected to result in an increase in trips and VMT by reducing delays. If TCM 11 results in increased VMT in the region, there may be increased emissions of NO<sub>x</sub>, PM<sub>10</sub>, and possibly other air and water pollutants. Since increases in trips and VMT run counter to performance standards in the California Clean Air Act, the Air District has asked the Air Resources Board to consider whether MTOS is an appropriate measure for air quality plans.

Installation of freeway ramp meters has the potential to create traffic congestion on local streets adjacent to the ramps. Mitigation measures can be implemented to reduce this impact, including arterial traffic management, as described in TCM 12.

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## TCM 12 - IMPROVE ARTERIAL TRAFFIC MANAGEMENT

### Purpose

By improving the flow of transit, bicycles, pedestrians and motor vehicles on arterial routes, TCM 12 will reduce emissions and congestion.

### Background

Arterial routes play a critical role in the regional transportation system. They are used on a high percentage of trips, both for short distance trips (shopping, errands, recreation), as well as for longer trips. Vehicle travel on arterials produces relatively high emissions per mile, due to low average speed and frequent stops and starts.

MTC projects that vehicle travel on arterial routes will increase substantially over the next twenty years. Measures to reduce the growth rate of motor vehicle trips on arterials and improve arterial traffic flow are essential to maintain regional mobility and to avoid an increase in vehicle emissions due to congestion. On congested routes, a relatively small reduction in vehicle traffic yields substantial reduction in traffic congestion. Similarly, improvements in traffic flow can result in short term air quality improvements. Arterials also serve key bus routes throughout the region. Improving the flow and number of buses on arterials can reduce bus travel times and stimulate increased transit patronage.

San Francisco's Municipal Railway installed transit signal preemption along Church Street in 1988 and found transit vehicle delays at intersections were reduced by 73 to 90 percent. The Air District has also funded transit signal preemption projects in Sonoma and Alameda Counties.

### Description

The TCM 12 strategies listed below, particularly those for transit riders, bicyclists and pedestrians, are recommended for implementation on all arterials throughout the Bay Area to reduce air emissions and traffic congestion. Implementation of TCM 12 will require cooperation among MTC, the Air District, Caltrans, cities and counties, Congestion Management Agencies, and transit operators. Congestion Management Programs (CMPs) should include the arterial traffic management strategies outlined below as a key component of their Capital Improvements Program. MTC will review CMPs to ensure coordination between neighboring cities in the development of arterial traffic management plans.

Local agencies and transit operators will examine ways to improve the flow of buses, commercial vehicles, bicycles and pedestrians through signal preemption, relocation and redesign of bus stops, re-striping and other means. These efforts are related to the CMP requirement for developing and maintaining transit service standards.

Below is a menu of arterial traffic management strategies that should reduce emissions by reducing congestion and enhance opportunities for taking transit, bicycling or walking:

- **Transit**
  - Special transit only lanes including enforcement
  - Signal preemption or, where there is significant bus traffic, timing lights for buses rather than autos
  - Enforce parking restrictions
  - Add bus pull-outs and bulb-outs
  - Adopt / implement "transit first" policies
- **Traffic control**
  - Interjurisdictional signal coordination
  - Freeway/arterial signal coordination

- Maintenance and periodic signal timing and upgrade programs
- Install "smart" systems such as adaptive signal systems
- Implement citywide Traffic Signal Operation Systems (TSOS)

- **Bicycle / Pedestrian Improvements**

- Add signing, striping and signals to enhance the street environment and improve safety for bicyclists and pedestrians
- Consider bicycle access in planning for all new arterial road construction or modifications
- Improve, add, redesign mid-block crossings
- Bicycle loop detectors for signals

### **Travel Market Affected**

TCM 12 will affect the entire range of motor vehicle, transit, bicycle and pedestrian trips, including commute travel, school travel, shopping, personal business, recreation, and commercial travel.

### **Effectiveness**

TCM 12 is expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.10 tpd	0.05 tpd
2015	0.20 tpd	0.12 tpd

By reducing congestion, the traffic control elements of TCM 12 will (like TCM 11) produce an increase in vehicle trips and VMT.

### **Cost**

MTC programs approximately \$5 million every two years for signal timing programs. Over the past five years, the Air District has funded \$9.5 million in signal timing projects. The cost of capital improvements that incorporate the above in ongoing upgrade and rehabilitation arterial programs cannot be determined.

### **Impediments**

Full implementation of TCM 12, will require a commitment from local jurisdictions who are largely responsible for arterial improvements.

### **Other Impacts**

Dedicating more space and improving the quality of space provided to transit, bicyclists and pedestrians will help achieve shifts in modal choice towards these less polluting modes. By improving the flow of bus traffic, TCM 12 may help to stimulate increased transit ridership. More consistent speeds on roadways will improve the capacity and efficiency of motor vehicle travel thereby reducing serious accidents, excessive energy consumption and noise.

## **TCM 13 - TRANSIT USE INCENTIVES**

### **Purpose**

TCM 13 will help to increase transit use and reduce motor vehicle travel by reducing selected fares and expanding the marketing of transit tickets and passes and by improving service, fare and other coordination activities between transit operators.

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## Background

To shift auto trips to transit, transit must be competitive with the private automobile in terms of cost, travel time and convenience. There are currently 25 transit operators in the nine county Bay Area. While this structure provides good local service in many areas, more can be done to improve the convenience for the transit rider whose travel requires the use of more than one agency's services to complete a trip.

Although transit already plays a key role in peak period commute travel, it is underutilized for non-commute trips such as shopping and recreation. Special reduced fares can increase transit ridership for non-commute purposes during off-peak periods and weekends when there is considerable excess capacity.

In addition to stimulating transit use, reductions in transit fares will help to address "equity" concerns related to revenue-generating and pricing measures (TCM 18).

## Description

TCM 13 includes the following:

### Phase 1 (1998 - 2000)

- Maintenance of the fare and transfer revenue sharing agreements currently required by MTC and state law. MTC requires each transit agency in the region to maintain a fare/transfer revenue sharing agreement with every connecting agency. These agreements typically include requirements that improve the convenience of transferring, and streamline or eliminate fare payments for those transferring between systems.
- Maintenance of critical regional transit service links including Dumbarton bus bridge service, Richmond Bridge bus service, Martinez Link bus service from West Contra Costa County to Martinez, and San Mateo Bridge bus service.
- Maintenance and expansion of the Regional Transit Connection (RTC) Clearinghouse program which provide tickets and passes and service information to transit users through their employers. (The effectiveness of this program is being reviewed by operators.)
- Maintenance and expansion of the Commuter Check program which sells transit vouchers to employers who then give them to employees to purchase tickets and passes.
- Implement the regional TransLink program. TransLink is a program that utilizes "smart card" technology for the collection of fares on all the region's transit systems. It will significantly improve the convenience of fare payment and collection.
- Develop a coordinated transit incident response plan in the event of temporary shutdowns of regional transit services (i.e., bridge closures, freeway construction projects). The coordinated response plan would address issues such as communication and the development of transit options so that the public would be minimally inconvenienced.
- Construct transit centers as identified in AC Transit's *Comprehensive Service Plan* in Alameda and Contra Costa Counties
- Construct (or enter into a shared use agreement to provide) park and ride lots on arterials or near freeway interchanges to increase patronage of express transit services

### Phase 3 (Beyond 2003)

Phase 3 measures include fare reductions for target groups. Full implementation of Phase 3 elements requires approval of legislation to provide additional revenues (see TCM 18).

Measures for fare reduction include:

- Reduced fares for special events

- Lower fares for transit lines with excess capacity
- Lower fares in the off-peak
- Pilot free fare zones in downtown areas

### **Travel Market Affected**

TCM 13 will make transit a more attractive and convenient option for a wide range of trips. Measures to promote the sale and subsidy of transit passes through employers (the RTC and "Commuter Check" programs), and maintenance of important regional transit links focus on commute travel. Measures to improve transfer convenience, reduce transfer cost and provide information support all types of transit trips.

### **Effectiveness**

TCM 13 is expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.13 tpd	0.11 tpd
2015	0.21 tpd	0.16 tpd

### **Cost**

Full implementation of TransLink to all regional transit operators is estimated to cost \$38 million. The Regional Telephone Information Service will cost approximately \$100,000/year. Maintenance of the fare and schedule agreements has an unknown cost, which is currently built in the cost structure of transit operators.

Maintenance of critical regional transit links cost approximately \$1.2 million /year in operating costs.

The RTC Clearinghouse and Commuter Check program cost approximately \$400,000/year. Finally development and implementation of a coordinated transit incident response plan depends upon the number and type of incidents.

### **Impediments**

The principal obstacle to full implementation of TCM 13 is the need to obtain additional funding sources for the Phase 3 fare reductions.

### **Other Impacts**

In addition to reducing emissions, TCM 13 will help to reduce traffic congestion and fuel consumption. This measure should also increase transit patronage, provide more convenient service for transit users, and promote increased mobility for riders who are sensitive to fare levels and convenience. TCM 13 will benefit the transit dependent population in the region.

By reducing motor vehicle use, TCM 13 will result in reduced vehicle wear and tear and depreciation, reduced costs for roadway maintenance, and reduced need for parking at employment and other sites in the region. Water pollution will also be reduced.

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## TCM 14 - TRIP REDUCTION SERVICES

### Purpose

The purpose of TCM 14 is to reduce motor vehicle travel and vehicle emissions by promoting carpooling, vanpooling, and other commute alternatives (e.g. transit and bicycling) as an alternative to the single occupant vehicle.

### Background

Formal efforts to promote ridesharing in the Bay Area began in response to the oil crises of the 1970's. The State has been the primary funding source for such efforts, providing funding to RIDES for Bay Area Commuters and other regional rideshare programs in the State. However, in the past several years, State funding has been severely reduced for regional ridesharing programs.

In 1995, responsibility for administering the regional rideshare program transferred from Caltrans to MTC. MTC entered into an agreement with RIDES to provide regional ridesharing services for a five-year period. Future State funding for the regional rideshare program is uncertain, and the key issue in the short-term is to identify a stable funding source for the regional rideshare program to allow this valuable service to continue.

The challenge for the region is to maintain a viable ridesharing effort in an era of reduced funding, diminished political support for trip reduction efforts, and cut-backs in employer-based trip reduction programs after the repeal of mandatory employer trip reduction requirements.

### Description

MTC will administer the regional rideshare program to provide the following core services to the Bay Area public: ridematching information; vanpool formation and support; information on other commute alternatives, including transit, bicycling and telecommuting; outreach and promotion to generate new ridematching applications (e.g. Rideshare Week, transportation fairs, Commute Mobile events, etc.).

MTC will develop a long-term funding plan for the regional ridesharing program although there is no guarantee that funding will continue to be available.

MTC will analyze the current ridematching software and recommend enhancements to improve the efficiency and effectiveness of the ridematching system.

Caltrans should implement traffic management programs (TMPs) to promote ridesharing and other transportation alternatives in corridors that are slated for major construction.

Sub-regional and local trip reduction programs funded by county Congestion Management Agencies will complement the regional rideshare program by providing enhanced marketing and services in targeted areas.

Potential new initiatives include the following:

#### Phase 1 (1998 - 2000)

- **Demand-responsive real-time shared ride services.** Traditional ridesharing services focus on ridematching for regular daily trips, generally commute trips which occur on a fixed daily schedule between established origins and destinations. Available technology can facilitate "real-time" ridesharing on a one-time or occasional basis for a wide variety of trip purposes. Real-time ridematching could be performed via internet, or using other

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media such as kiosks installed in public locations (transit stations, airports, worksites, etc.).

- **Medium distance vanpools.** Explore expansion of vanpooling in the medium distance commute market (i.e. 15-30 miles one-way trip distance). Vanpools have proven to be viable in the long distance commute market (30+ miles one-way), but they have failed to penetrate the medium distance commute market (15-30 miles one-way) to any significant degree. One option is to promote the use of clean fuel vanpools (e.g. CNG vans) in the medium distance market if the SMARTPool program in San Mateo County demonstrates that this concept is viable.

### **Phase 3 (Beyond 2003)**

- **Real-time matching.** Real-time matching could also be used to facilitate shared-ride van services. Such service could be based on the airport shuttle concept, but designed to serve multiple origins and destinations, rather than a single destination such as an airport.

### **Travel Market Affected**

This TCM focuses on commute travel, which accounts for approximately 25% of trips and 33% of VMT on a typical weekday. However, the ridematching system has potential applications for other types of trips, such as home-to-school trips, as well as trips to airports and other major activity centers. The potential market for the real time ridematching concept and/or shared-ride van concept is large, but difficult to quantify until the specific approach is better defined.

### **Effectiveness**

Since this measure does not increase the current level of effort by local and regional agencies or the private sector, no emissions reductions are assumed beyond what has already occurred and will continue to occur:

	<u>ROG</u>	<u>NO<sub>x</sub></u>
2005	0.00 tpd	0.00 tpd
2015	0.00 tpd	0.00 tpd

However, without maintaining current efforts, commute trips would likely increase. Data from the regional rideshare program show that this effort is cost-effective relative to most other types of TCMs. The regional rideshare program is estimated to reduce at least 0.15 tons of ROG and 0.15 tons of NO<sub>x</sub> per day.

### **Cost**

The cost to implement the regional rideshare program is approximately \$3 million per year. The Air District supported this program with \$1 million in FY 1997-98.

### **Impediments**

The primary impediment is the lack of a long-term funding strategy for the regional rideshare program. A secondary impediment is the decline in the number of requests for ridematching assistance, as some employers reduce their participation in promotional activities such as on-site commute fairs in the wake of the repeal of mandatory trip reduction programs.

### **Other Impacts**

In addition to reducing emissions, this TCM will reduce traffic congestion, fuel consumption, vehicle maintenance costs, roadway maintenance costs, water pollution, and carbon dioxide (CO<sub>2</sub>) emissions.

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## TCM 15 - LOCAL CLEAN AIR PLANS, POLICIES AND PROGRAMS

### Purpose

TCM 15 encourages cities and counties to address the air quality impacts of local activities by adopting and implementing air quality-beneficial plans, policies and programs. Land use patterns directly affect travel behavior. Motor vehicles are a major source of carbon monoxide, fine particulates, ground-level ozone precursors, toxic air contaminants and other air pollutants. TCM 15 seeks to reduce motor vehicle emissions by promoting land use development that facilitates walking, bicycling and transit use. TCM 15 also would reduce motor vehicle use and increase transit ridership by encouraging local governments and transit agencies to cooperate in planning and promoting high density, mixed use developments at multi-modal stations, transit centers and along transit corridors.

### Background

The Air District adopted Resolution 1666 in May 1986 urging local governments to address the air quality impacts of all local activities by incorporating air quality elements into their general plans. To date, approximately 60 of the 103 cities and counties in the Air District have complied.

The California Clean Air Act (CCAA) requires regional clean air plans to include indirect source control programs to encourage developments, as well as local and regional plans, which:

- Minimize dependence on motor vehicles and, thereby, reduce air contaminant emissions;
- Require mitigation of adverse air quality impacts of facilities that do attract a significant volume of motor vehicle traffic.

TCM 15 responds to Resolution 1666 and the indirect source requirements of the CCAA. This measure encourages cities and counties to address the indirect source control requirements of the CCAA.

### Description

Cities and counties can integrate air quality-beneficial policies and programs into general plans and related implementation programs such as subdivision regulations, zoning ordinances, capital improvement programs, parking requirements, and development design guidelines. Localities can produce separate air quality elements, or can incorporate air-quality beneficial policies into the land use, circulation/transportation, and other required elements of the general plan. In using either approach, jurisdictions should promote consistency among general plan elements, between the general plan and related implementation measures, and between local, regional, state and national policies and programs.

Reducing air pollution related to the use of motor vehicles is the primary goal. Improved integration of land use, transportation and air quality planning can enhance the viability of walking, bicycling and transit. Implementation strategies include encouraging compact community land use patterns, promoting infill development, zoning for higher densities and mixed uses near transit centers and corridors, increasing the supply of housing near employment, restricting parking in downtowns and at job centers while providing alternatives to the single occupancy vehicle, reducing residential parking, developing an interconnected street network, improving transit service, and adopting community and site design standards that provide safe, convenient and attractive environments for pedestrians, bicyclists and transit users. Cities and counties, when updating their general plans, should assure that the local plan is consistent with the regional Clean Air Plan. The Air District will provide technical assistance in making consistency determinations.

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The Association of Bay Area Governments (ABAG) and the Air District have developed a guidebook entitled *Improving Air Quality Through Local Plans and Programs* to assist cities and counties in developing policies and implementation strategies to benefit air quality. Copies were distributed to local planners and decision makers at a series of subregional workshops during Fall 1994.

ABAG will continue to sponsor subregional planning pilot projects to encourage cooperation among neighboring jurisdictions and promote subregional approaches to issues including land use, transportation and air quality.

The Air District will consult with and provide technical assistance to local jurisdictions seeking to develop local clean air plans, policies and programs, and will review current plans to suggest improved strategies and methods.

ABAG, MTC and the Air District will explore ways to provide incentives to jurisdictions that implement air quality-beneficial policies and programs, and encourage them to provide incentives to developers who follow them.

The Air District and MTC will highlight and publicize noteworthy examples of local clean air plans, policies and programs, as well as noteworthy development projects.

Cities and counties are encouraged to require the provision of bicycle access and facilities (e.g., secure parking and showers/lockers, where appropriate) at developments such as office parks, shopping centers, and residential complexes (see TCM 9). Where feasible, access and facilities should be incorporated directly into site design for new development.

Cities and counties should assure that local plans, policies and programs encourage walking and promote a safe and convenient pedestrian environment (see TCM 19).

Cities and counties, in cooperation with transit providers, should prepare transit station area plans for appropriate transit stations and transit centers, with the goal of promoting higher density, mixed use development, multimodal connections and convenient pedestrian access in order to increase transit use, walking and other alternative modes.

ABAG will encourage integration of air quality-beneficial policies and implementation strategies in subregional plans through outreach to bodies such as CMAs and countywide planning agencies.

The Air District has updated its guidelines for local jurisdictions regarding air quality analysis of projects and plans (May 1996) and will continue to provide technical support.

The Air District will encourage cities and counties to develop strategies to reduce emissions from sources other than motor vehicles, such as lawn and garden equipment, woodstoves and fireplaces, and residential and commercial energy consumption.

MTC will encourage transportation projects that support objectives in MTC's Transportation/Land Use Connection policy statement, and development that minimizes vehicle trips and enables residents to use alternative travel options such as walking, transit and biking. One means MTC will use to encourage supportive transportation projects is through its multimodal scoring process, which should stress funding improvements for transit, bicycling and walking.

MTC has prepared and distributed a guide entitled *Moving Toward More Community-Oriented Transportation Strategies for the San Francisco Bay Area - A Resource Guide* - and will examine additional strategies - to promote community-oriented transportation projects.

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## Travel Market Affected

Local planning and decision making to improve air quality and reduce motor vehicle travel will address all types of trips—commute, shopping, school, recreation, social, and personal business.

## Effectiveness

TCM 15 is expected to yield the following emission reductions:

	<u>ROG</u>	<u>NO<sub>x</sub></u>
2005	0.02 tpd	0.01 tpd
2015	0.01 tpd	0.01 tpd

This TCM would reduce emissions over the long term by promoting better integration of land use and transportation at the local level and by supporting the implementation of the other TCMs in the CAP.

## Cost

TCM 15 has an estimated regionwide cost of \$3 - \$3.5 million. This estimate assumes an average cost for plan preparation of approximately \$50,000 to each of the Bay Area's nine counties and between \$5,000 and \$50,000 to each of the 94 cities in the Air District's jurisdiction. Annual cost to prepare station area plans for transit stations is estimated at \$500,000.

## Impediments

Limited funding and staff time for local governments to prepare and implement local clean air plans, policies, and programs will impede full implementation of TCM 15. Other impediments include neighborhood concerns over innovative plans and development proposals, and the need to develop creative design solutions to address concerns about increased density and auto traffic in the vicinity of transit stations.

## Other Impacts

Local plans, policies and programs that effectively integrate land use, transportation and air quality considerations can help cities and counties achieve the following benefits:

- Improve housing supply and affordability
- Reduce traffic congestion
- Increase mobility
- Conserve energy
- Improve water quality
- Preserve open space, agriculture and other land resources
- Use infrastructure and land more efficiently
- Reduce roadway construction and maintenance costs
- Increase transit ridership
- Improve economic competitiveness
- Enhance community attractiveness and quality of life

Local plans, policies and programs also can reduce emissions from sources other than motor vehicles, such as woodstoves and fireplaces, lawn and garden equipment, natural gas combustion and electrical power generation, and can provide for buffer zones between emissions sources and sensitive receptors.

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## TCM 16 - INTERMITTENT CONTROL MEASURE / PUBLIC EDUCATION

### Purpose

The purpose of this measure is to educate the public about air quality in the Bay Area and encourage residents to make choices that have a positive effect on air quality, particularly regarding transportation and consumer activities. Special emphasis is placed on the need to curtail polluting activities on days when air quality is poor so that emissions can be reduced and violations of federal and state air quality standards can be avoided. This element of the program is called *Spare the Air*. It began in 1991 and is continuing.

### Background

Since motor vehicles are the leading source of air pollution in the Bay Area, meeting state air quality standards will require the support of the motoring public. The success of the Clean Air Plan will depend to a significant extent on the voluntary cooperation of individuals. Research on public attitudes about air quality conducted in the Bay Area indicates that the public is committed to clean air and is willing to help achieve the goal if given rational choices and options. Surveys conducted in 1996 indicate that the public is altering its behavior in response to air quality goals. This trend needs to continue and be encouraged.

### Description

*Spare the Air* is an intermittent, voluntary control program. It focuses on the 10 to 15 days per year when air quality is expected to be poor. On these days, the Air District issues *Spare the Air* requests and asks Bay Area residents to curtail or postpone consumer activities that pollute. This includes eliminating unnecessary driving by biking, walking, telecommuting, taking public transit or carpooling instead. It also includes linking motor vehicle trips together ("trip-linking") to avoid polluting cold starts. In 1997, Caltrans posted notices on variable message signs on Bay Area freeways letting motorists know of *Spare the Air* days. Residents are also asked to avoid consumer activities that generate pollution such as use of hair sprays, pesticides, small gasoline engines, household painting projects that use oil-based paints, and the use of recreational boats. Together these activities generate over 200 tons per day of organic gases in the Bay Area.

*Spare the Air* days are declared when any part of the Bay Area is predicted to have 92 or greater (0.11 parts per million) on the Pollutant Standards Index (PSI) scale - approaching the federal standard for ozone. Predictions are made the previous afternoon by Air District meteorologists.

In 1992, the Air District added a new element to the program called *Employer Spare the Air*. Employers who joined the program pledged to educate their employees on air quality and *Spare the Air*, and to notify employees of *Spare the Air* days. The Air District makes numerous educational materials available to the employers including brochures, a video, posters, signs, sample newsletter articles, and training sessions. Approximately 600 employers representing 600,000 employees now participate.

Topics addressed in the public outreach effort of this TCM include:

- Health effects of air pollution,
- Connection between air pollution and motor vehicle usage,
- Benefits of leaving a single-occupant motor vehicle at home on poor air quality days,
- Benefits to the environment of carpooling, vanpooling, taking public transit, biking, walking, or telecommuting,
- Air pollution effects of motor vehicles that are not properly tuned,
- Benefits of trip-linking,

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- Air quality advantages of avoiding consumer products that pollute on high ozone days and using electric or hand-powered lawn mowers and leaf blowers instead of gasoline powered models.

In 1996, the Air District, the Bay Area Council and the Santa Clara Valley Manufacturing Group established the Bay Area Clean Air Partnership (*BayCAP*) to enhance the effectiveness of the *Spare the Air* program and to quantify the effectiveness of voluntary trip reduction efforts by Bay Area employers. *BayCAP*'s mission is to help the region avoid exceedances through implementing voluntary actions, document the results achieved and explore new voluntary controls. In 1997, *BayCAP* established the *Spare the Air Cities* program to highlight and encourage efforts by cities and counties to clean the air during the summer smog season. *BayCAP* will be continued and expanded in order to enhance public-private cooperation and achieve greater emissions reductions.

### **Travel Market Affected**

The intermittent control program is aimed at the general public with special emphasis on motorists. *Employer Spare the Air* is aimed at the 600,000 employees at participating work sites. However, a strong component is the idea that everyone can do something to help the environment even if they do not drive or can not curtail motor vehicle use.

### **Effectiveness**

The 1996 *Spare the Air* program resulted in an estimated 0.35 - 1.25 tons per *Spare the Air* day reduction in ROG and a 0.07 - 0.99 ton reduction in NO<sub>x</sub>. The number of *Spare the Air* days will vary each year. Through 2000, the Air District does not anticipate expanding this program since no new funding has been identified. Thus, no additional emissions reductions are expected.

### **Cost**

The annual cost of the *Spare the Air* program is approximately \$350,000 which includes staff and consultant time for the public and employer program, the printing and distribution of materials, and radio advertising. *BayCAP* is produced largely through donation of staff time by participating firms and agencies.

### **Implementation**

The *Spare the Air* program, along with other aspects of the Air District's public outreach efforts, receives input from the Air District's Public Outreach Steering Committee, which is composed of representatives from the business community, labor, local government, civic and environmental groups. The Committee has helped develop and implement the program, and meets regularly to assess progress and next steps. The Air District has also formed grass-roots resource teams on the local level and region-wide resource teams for large employers and media and education representatives all of whom help implement and give feedback to the campaign.

### **Other Impacts**

This measure raises the awareness of the public about the causes of and solutions to the air pollution problem. Although the TCM addresses intermittent controls, it may have a broader impact. People who choose to change their travel or other behaviors in response to a voluntary request may continue to reduce vehicle use or change the type of consumer products they use on a regular basis.

The idea of intermittent controls can also be transferred to wintertime when carbon monoxide and particulate levels can be elevated. The Air District's wintertime intermittent control program, *Spare the Air Tonight*, is aimed at curtailing woodburning when air quality is poor. This program benefits from the awareness generated by the summertime program.

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## TCM 17 - CONDUCT DEMONSTRATION PROJECTS

### Purpose

This measure will promote demonstration projects to encourage innovative approaches to reduce motor vehicle travel and mobile source emissions.

### Background

Additional work remains to be done in terms of testing new approaches and monitoring their effectiveness, quantifying emission reductions and travel benefits, and evaluating the synergistic effects of complementary measures. It is important to encourage demonstration projects which can serve as models for trip reduction and travel demand efforts and clean fueled vehicles and infrastructure throughout the region.

### Description

This measure would undertake various demonstration projects and studies to further develop strategies that will ultimately be required to help achieve State air quality standards. The Air District MTC, Caltrans and FHWA will cooperate with employers, public agencies, and the private sector in developing demonstration projects. Examples are as follows:

- Electronic Toll Collection, which offers the potential to enhance the implementation of congestion pricing discussed in TCM 18. Caltrans will fund the installation of electronic toll collection equipment on State bridges. Testing of the reliability of the collection equipment is scheduled for early 1997, with public deployment of the technology scheduled later in 1997 on the Carquinez bridge. Installation on the Antioch, Benicia-Martinez, Richmond-San Rafael, and San Francisco-Oakland bridges should be complete by the end of 1998.
- Efforts to increase low emission vehicle use by public and private sector fleets.
- Additional projects will be developed to promote use of low emission vehicles (see mobile source control measures in Appendix G). These projects will include both on-road and off-road vehicles with a variety of uses and fuels. Expanding the refueling infrastructure for these vehicles is an integral part of increasing their use, and demonstrations that expand the publicly-accessible refueling infrastructure will continue to be developed. An initial demonstration by the Air District to provide a \$5,000 per vehicle financial incentive to private fleets purchasing electric vehicles is planned for 1997.
- Other demonstration projects may be developed if funding and political support become available. These may include strategies to reduce emissions from lawn and garden equipment, pleasure boats and jet skis, and motor scooters and delivery service vehicles. They may include projects to reduce the urban heat island effect in the region and the consequent temperature increases and elevations in ozone concentrations. They may include strategies to reduce diesel vehicle idling, and to reduce emissions from unregistered vehicles operated outside the inspection and maintenance program.

### Travel Market Affected

The proposed demonstration projects would directly effect only a small percentage of travel in the region. However, the experience gained through these projects will be of great benefit in developing policies and programs that affect all types of travel in the region, including commuting, shopping, recreation and personal business, and commercial travel.

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## Effectiveness

If the current level of Air District Transportation Fund for Clean Air money spent on clean air vehicles remains constant, the clean air vehicle demonstration project should yield the following emissions reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.02 tpd	0.04 tpd
2015	0.01 tpd	0.04 tpd

Because the success of other demonstration projects is unknown, no direct emission reductions are claimed. However, other demonstration projects should contribute to reduced emissions by providing tested models to use in crafting effective programs on a local or region-wide basis.

## Cost

This Air District has granted approximately \$2,800,000 per year for clean air vehicles and infrastructure. The above emissions reductions assume maintenance of this level of funding. The funding has been used to help public fleets acquire natural gas and electric vehicles. Funding levels vary from one project to the next. Typical recent projects have provided roughly the incremental cost for natural gas sedans and pickups (roughly \$5,000 per vehicle) and half the cost for electric vehicles (\$6,000 per year for a three-year lease). Clean air sedans, pickups and special purpose vehicles are being used in a variety of settings: pool cars, parking enforcement vehicles, maintenance vehicles, waste haulers, and street sweepers.

Although future projects may differ from the mix the Air District has previously funded, the above emissions reductions assume maintenance of the current level of funding and no significant improvement in technology that would increase the rate of emissions reductions. Technology advancement or a lower incremental cost between old and current technologies would increase the effectiveness of the Air District's clean air vehicle program.

For other demonstration projects, costs would depend on the number and extent of demonstration projects implemented.

## Impediments

Depending upon the demonstration project, the Air District and MTC may need to secure additional revenue to assure full implementation of TCM 17. If legislation to enact transportation pricing reform is approved (see TCM 18), a portion of this funding could be allocated to demonstration projects. Transportation Fund for Clean Air funds may be available for some types of demonstration projects. Some funding for demonstration projects may also be forthcoming from State and federal agencies and from the private sector. Caltrans is funding the electronic toll collection project. The California Energy Commission is using a federal Department of Energy grant to fund the financial incentives for electric vehicle purchases.

## Other Impacts

The demonstration projects in TCM 17 could have considerable impacts beyond air quality, if implemented on a widespread basis. Electronic toll collection could potentially help reduce congestion in the vicinity of the bridge toll plazas. Efforts to increase the use of alternative fuels for transportation could have significant economic benefits, especially to the extent that such vehicles or their components are developed within the region.

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## **TCM 18: IMPLEMENT TRANSPORTATION PRICING REFORM**

### **Purpose**

TCM 18 is designed to do two things. First, it is intended to reduce motor vehicle emissions and traffic congestion through a combination of pricing measures, including "smog-based" vehicle registration fees, higher gas taxes, feebates and "congestion pricing." Second, it is intended to secure additional revenue needed to fully fund other TCMs.

### **Background**

We cannot expect people to significantly reduce single occupancy auto travel unless they pay the full costs of driving, and also have access to viable alternatives in the form of improved and expanded transit service, high occupancy vehicle lanes, vanpools, and bicycle and pedestrian facilities. The CAP therefore contains a set of mobility measures to improve options to the single occupant vehicle. Although partial funding is currently available for most projects, MTC estimates that additional revenues of \$150 to 200 million per year are needed to fully fund the regional transportation program identified in the 1996 *Regional Transportation Plan*.

Furthermore, there is growing acknowledgment that solutions to air quality and traffic congestion problems depend upon basic changes in the way that transportation is funded and priced in the United States. The costs of owning and operating an automobile are much lower in the United States than in other developed nations, and do not fully reflect the total economic, environmental and societal costs of auto ownership and use. The low cost of driving and the substantial public investment in roads and highways combine to stimulate motor vehicle travel, while discouraging the use of alternative modes such as transit. Large growth in vehicle ownership and vehicle miles traveled (VMT) over the past several decades has led to increasingly severe traffic congestion in the Bay Area and may have slowed the overall trend of steadily improving air quality.

Over the past several years, support has grown for measures to increase the cost of driving and to implement "congestion pricing" so that expenses borne by drivers more accurately reflect the full costs of their travel decisions. Pricing measures can affect decisions regarding what types of vehicles are used, how much they are used, and when and where they are used.. Support for pricing measures spans a diverse range of interests, including business and environmental groups. Advocates of pricing measures point out that these measures affect the full spectrum of vehicle users and trip purposes.

The cost of driving includes both ownership costs (purchase, interest, insurance, depreciation and registration) and operating costs (fuel, tolls, parking, etc.). Ownership costs are largely "fixed" costs, while operating costs are "variable." Automobile owners are primarily influenced by variable operating costs in making daily travel decisions. Therefore, increases in variable costs are most effective in reducing motor vehicle use. Increases in fixed costs can influence how many and what types of vehicles are in use.

Although pricing measures offer strong potential for reducing air pollution and congestion, these measures must be implemented in conjunction with programs to ensure that pricing measures do not place an undue burden on low income households.

### **Description**

The Air District and MTC will cooperate in developing legislative strategies needed to implement pricing measures. The specific details of the pricing measures will be determined through the process of drafting and securing approval of the legislation.

TCM 18 consists of five pricing strategies, spread over the three phases of the CAP. General descriptions are provided below:

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### Phase 1 (1998 - 2000)

- **Congestion Pricing.** MTC, FHWA and Caltrans conducted a study of congestion pricing on the Oakland-San Francisco Bay Bridge. The study identified: a recommended congestion pricing strategy; priorities for improvements to transit and other SOV alternatives in the corridor, and; measures to minimize impacts on drivers from low income households. If authorized by the legislature, MTC and Caltrans will begin a demonstration of congestion pricing on the bridge. If this demonstration is successful, congestion pricing may be expanded to other bridges in the region.
- **Gas Tax Increase of 10 Cents per Gallon.** In addition to slightly discouraging driving, this measure would generate revenues of approximately \$200 million per year, a significant portion of the revenue needed to fund the mobility improvements in the CAP. An increase in the gas tax of at least this amount, or a pricing measure generating an equivalent amount of revenue, is essential to implementing the TCMs.
- **Expand Parking Cash-Out Program.** AB 2109 was passed into law in 1992 to require employers who lease parking and meet other specified criteria to offer employees cash in an amount equal to the subsidy for an employee's parking space. Until recently, implementation of the parking cash-out requirement was not viable due to a peculiar provision of the federal tax code. In effect, federal tax law meant that if an employer offered the parking cash-out option, then the parking benefit (which is otherwise untaxed) would be treated as taxable income to the employee. With the recent revision to the federal tax code, employees who elect to receive the cash in lieu of the parking subsidy are taxed on the additional income, but those employees who choose to continue receiving the parking subsidy are not subject to taxation of that benefit. Thus, the cash-out provision has no negative tax consequences for employees who continue to choose the subsidized parking. The District will work with ARB to investigate ways of implementing the state parking cash-out law.

### Phase 2 (2001 - 2003)

- **Gas Tax Increase of up to 50 Cents per Gallon.** This measure would generate revenues of approximately \$1 billion per year. An increase in the gas tax of this amount would allow the region to fully implement the CAP, and make significant improvements in transit service.

### Phase 3 (Beyond 2003)

- **Smog-Based Vehicle Registration Fees.** Vehicle registration fees would be based on the calculated annual emissions from each vehicle, derived from the odometer reading and a representative measurement of tailpipe emissions. Fees would range from \$20 per year to over \$1000 per year, depending on the vehicle and its pattern of use. Total revenue from smog fees would be approximately \$500 million per year, an average of about \$125 per vehicle.
- **"Feebates" on New Vehicle Purchases.** Fees would be added to the purchase price of new vehicles with high emissions, while rebates would be subtracted from the price of vehicles with low emissions. Feebates could be based solely on vehicle emission rates, and/or could incorporate fuel efficiency. The feebates could be structured to raise additional revenue or could be revenue neutral.
- **Gas Tax Increase of up to \$2 per Gallon.** Over a ten year period, gas taxes could be gradually increased by a total of up to \$2 per gallon. This would bring our gasoline prices to a level closer to those of many other developed countries and would significantly reducing motor vehicle emissions. At full implementation, this measure

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would generate revenues of approximately \$4 billion per year, or about \$1000 per vehicle, which would allow extensive improvements in transit service.

Each of the measures would reduce motor vehicle emissions. However, they would achieve this effect in different ways. While the gas tax increase would operate by reducing vehicle trips and VMT, congestion pricing would operate primarily by shifting trips temporally and spatially so as to reduce congestion-related emissions. The smog-based vehicle registration fees would operate by encouraging drivers to reduce their use of high-emitting vehicles, while feebates would encourage new vehicle purchasers to seek cleaner vehicles. Both the congestion pricing and the smog-based registration fees would therefore reduce vehicular emissions much more than they would reduce vehicle trips and VMT.

Market-based measures not only can influence people's decisions regarding when, how much and in what type of vehicle they drive, land use patterns, and people's residential / work location decisions, but these measures also provide additional revenue. Limited funding is a significant impediment to the full implementation of many of the TCMs in this CAP. Revenues generated through market-based measures should be directed towards underfunded TCMs in order to expand alternatives to solo driving and assure that low income households are not adversely affected.

The Air District, MTC and other local and State transportation agencies will continue to refine the concepts for the above pricing measures in Phase 1. Full implementation would occur sometime beyond 2003 (Phase 3). Refinement of the package would provide details regarding the following elements:

- Revenue from the pricing measures would be used to establish a specific fund and/or programs to address economic impacts on low income households. Examples include subsidized transit passes, improved transit service, and income tax credits.
- Revenue from the pricing measures should be used to implement other TCMs in the CAP (and related transportation alternatives) that yield the greatest air quality benefits.

Bay Area business associations, government agencies and environmental organizations have expressed support for pricing measures. Their support will be needed to secure legislation authorizing pricing measures. Public education will be necessary to promote understanding and acceptance of pricing measures as a primary solution to the region's air quality and congestion problems.

### **Travel Market Affected**

Market-based measures would effect all types of travel, including commuting, commercial trips, shopping, personal business, and social and recreational travel.

Some of the measures may be implemented statewide, while others may be implemented only in the Bay Area. For those measures implemented only in the Bay Area, intraregional travel would probably be more impacted than inter-regional travel, since vehicles passing through the Bay Area would escape many of the pricing measures, such as "smog-based" registration fees, "feebates" and increased gas taxes. Measures implemented statewide would impact intra- and interregional travel.

### **Effectiveness**

TCM 18 is expected to yield the following *percentage* emission reductions:

		<u>ROG</u>	<u>NOx</u>
		*	*
2005	Congestion Pricing		
	Gas Tax \$0.10/gal.	0.42%	0.42%
	Parking Cash Out	0.90%	0.80%
	Gas Tax \$0.50/gal.	3.70%	3.40%

2015	Smog-Based Registration Fee	4.50%	2.50%
	Feebates	*	*
	Gas Tax \$2.00/gal.	7.80%	7.80%

\* Emission reductions would vary, depending on whether program is revenue neutral.

In total, this TCM would yield the following emissions reductions, many times the effectiveness of all other TCMs combined:

	<u>ROG</u>	<u>NOx</u>
2005	7.39 tpd	9.45 tpd
2015	10.91 tpd	26.39 tpd

## Cost

The initial 10 cents per gallon gas tax would generate revenues of approximately \$200 million per year or \$4 billion over a 20 year period. Pricing measures would obviously entail substantial out-of-pocket expenses for many drivers, especially those who are either unable or unwilling to shift to alternatives to the single occupant vehicle. However, most of these expenses represent transfers within the region's economy that could benefit the transportation disadvantaged (e.g., low income persons without access to a vehicle, children, the elderly) if the revenues were directed to enhanced transportation alternatives. Increased costs to households and businesses would be offset to a certain degree by reduced costs of vehicle ownership, operations and maintenance.

## Impediments

Opposition to measures that would substantially increase the cost of owning and operating a motor vehicle are likely to be the greatest obstacle to implementation of TCM 18. A major increase in gas taxes and implementation of congestion pricing of roadways may prove to be particularly controversial.

Measures to mitigate the impact of pricing measures on low income groups will be essential. It will also be important to educate the public and decision-makers about the considerable inequities in the current system of transportation financing in order to build support for an alternative financing system based on the proposed pricing measures.

## Other Impacts

In addition to substantially reducing vehicular emissions, TCM 18 would reduce vehicle trips, vehicle miles traveled, and traffic congestion. It would also reduce water pollution.

The reduction in traffic congestion would be greater than the reduction in vehicle trips, because congestion pricing measures would serve to better distribute traffic. It should be noted that, under congested conditions, removal of relatively few vehicles from the road yields a significant reduction in congestion. TCM 18 would also reduce fuel consumption, primarily due to large increase in gas taxes, which would induce manufacturers and consumers to shift toward more fuel-efficient vehicles.

TCM 18 would produce other beneficial effects, including:

- Reduced vehicular depreciation and wear and tear
- Reduced maintenance costs on the regional roadway network
- Reduced demand for new and expanded roads and highways
- Decreased water pollution from motor vehicles
- Reduced emissions of pollutants that are not specifically addressed in the CAP, including toxics, particulates (PM<sub>10</sub>) and global warming gases.

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## **TCM 19 - ADVOCATE PLANNING AND DESIGN OF DEVELOPMENT PROJECTS TO FACILITATE PEDESTRIAN TRAVEL**

### **Purpose**

This TCM will reduce motor vehicle travel and mobile source emissions by promoting measures that will increase walking.

### **Background**

Walking is the most basic form of transportation. It is also a completely non-polluting means of transportation. Virtually all travel, regardless of mode, entails some walking at some point in the trip.

Many factors influence a person's decision whether or not to walk for a particular trip. Implementing measures to make pedestrian travel safer, more convenient and more attractive will promote walking, particularly for short trips. Pedestrian improvements near transit facilities help make transit a more a more desirable travel mode as well.

### **Description**

There are numerous actions that should be pursued in order to increase pedestrian travel, including the following:

- Local general plans, specific plans and zoning ordinances should promote land use patterns that facilitate walking, such as increased densities, mixed land uses, focusing development around transit stops, strengthening downtowns and community centers, infill development and reuse/redevelopment of underutilized land.
- The design and placement of buildings in new development should encourage walking, for example by providing sidewalks/paths, minimizing setbacks, locating entrances near sidewalks and transit stops, locating parking in the rear, etc.
- An integrated street network with direct routes for pedestrians and ensuring easy pedestrian access between neighboring developments should be provided.
- Pedestrian amenities such as sidewalks, benches, landscaping, etc. should be provided at new development.
- Street design standards should enhance pedestrian safety and comfort through measures such as reduced street width, reduced turning radii, crosswalks with activated signals, curb extensions/bulbs, buffers between sidewalks and traffic lanes, street trees, etc. Traffic calming strategies are discussed in greater detail in TCM 20.
- Existing development and streets should be retrofitted to incorporate pedestrian-friendly improvements.

Cities and counties can undertake a variety of actions to promote pedestrian travel, including the following:

- Review and revise general and specific plans to assure that land use policies promote development patterns that encourage walking and circulation policies that emphasize pedestrian travel.
- Review and revise zoning ordinances, subdivision ordinances and other local programs to include pedestrian-friendly design standards/guidelines.
- Review and revise street design standards to promote pedestrian access, safety and comfort.
- Include pedestrian improvements in local capital improvement programs.
- Designate a staff person to be pedestrian or non-motorized (pedestrian/bicycle) program manager.

- Require developers to provide pedestrian amenities in new projects.
- Identify and implement pedestrian-friendly improvements to existing streets and developments.
- Emphasize pedestrian safety in enforcement of local traffic codes and public education campaigns.

The Air District, MTC and ABAG will emphasize pedestrian improvements in outreach to cities and counties on local plans, policies and programs (see TCM 15).

MTC and the Air District will emphasize flexible use of transportation funding in ISTEA reauthorization and other legislative efforts.

### **Travel Market Affected**

Pedestrian improvements can reduce vehicle travel associated with all types of trips, although there would probably be a greater impact on trips for shopping, school, recreation and personal business since these trip types generally are shorter in length than work trips.

According to the 1990 National Personal Transportation Survey, 14% of all travel trips are one-half mile or less in length, while 28% of all trips are one mile or less in length. These trips are within reasonable walking distance for active persons and represent an enormous opportunity to reduce motor vehicle use. Transportation Fund for Clean Air funds may be available for implementation of pedestrian improvement projects through County program managers.

### **Effectiveness**

TCM 19 is expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.71 tpd	0.84 tpd
2015	0.72 tpd	1.59 tpd

### **Cost**

Unknown.

### **Impediments**

Funding limitations would slow implementation of pedestrian improvements.

Safety concerns - related to crime as well as conflicts with motor vehicles - sometimes dissuade people from walking. Pedestrian improvements should enhance pedestrians' actual and perceived safety.

### **Other Impacts**

In addition to reducing motor vehicle emissions, increased pedestrian travel would result in reduced congestion, fuel consumption, water pollution and wear and tear on vehicles and roads.

Increased pedestrian travel also will benefit health and fitness and foster greater sense of community. Pedestrian improvements will improve safety.

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## TCM 20 - PROMOTE TRAFFIC CALMING MEASURES

### Purpose

"Traffic calming" is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users. It reduces air emissions by reducing the attractiveness and convenience of driving while increasing the attractiveness and convenience of transit, bicycling and walking. It also reduces emissions by smoothing traffic flow which reduces stop-and-go driving and delays at intersections.

### Background

Traffic calming modifies the streetscape to reduce the number and speed of motor vehicles and to increase the attractiveness of transit, bicycling and walking. As motor vehicle traffic has increased in the Bay Area, bicycling, walking and travel by bus have become less attractive alternatives. Traffic calming, most extensively implemented in Western Europe, reverses this trend. European experience shows that the maximum benefits of traffic calming are achieved when traffic calming is implemented area-wide. Traffic calming has grown fastest in Germany with one province reporting over 8,000 traffic calming areas in 1989. Many of the traffic calming techniques used in Europe have also been successful on a smaller scale in the United States. However, none of the projects conducted in the United States to date have been implemented on an area-wide basis.

The City of Palo Alto converted a two mile length of the residential Bryant Street that runs parallel to a busy arterial into a bicycle boulevard. Barriers were placed to restrict or prohibit through motor vehicle traffic but to allow bicycle traffic. Six months after the reconstruction, an evaluation showed a reduction in motor vehicle traffic and nearly a two-fold increase in bicycle traffic. Residents are generally pleased, since their streets are quieter.

### Description

The strategies listed below are recommended for implementation on streets throughout the Bay Area with the exception of freeways. Implementation of TCM 20 will require cooperation among MTC, Caltrans, cities and counties, Congestion Management Agencies, transit operators and public safety officials, and extensive public outreach. Cities and counties should include traffic calming strategies in the Transportation and Land Use elements of their general plans, and in specific plans. Congestion Management Programs (CMPs) should include traffic calming strategies in their capital improvements programs. MTC should review CMPs to ensure coordination between neighboring cities in the development of traffic calming plans.

The following actions can be taken to implement traffic calming in the Bay Area:

- **Pedestrian Streets.** Pedestrian streets exclusively reserve streets for use by pedestrians. Convert streets to pedestrian streets where:
  - Streets have significant pedestrian activity, and
  - Pedestrians are able to access the area via transit, bicycle or walking and the area is difficult to access by motor vehicle.
- **Residential and Neighborhood Traffic Calming.** Residential and neighborhood traffic calming attempts to reduce through traffic in residential areas and reduce speeds to 18 mph and less. The reduced traffic and lower speeds resulting from residential and neighborhood street traffic calming reduces emissions by improving conditions for bicyclists and pedestrians, thereby encouraging a mode shift to these non-polluting forms of transportation. Implement traffic calming on residential and neighborhood streets through:

- Road humps and speed tables which raise the surface of the road,
  - Traffic circles/mini-roundabouts that replace traffic signals and stop signs at intersections,
  - Narrowing of motor vehicle lanes, introduction of dedicated bike lanes and wider sidewalks,
  - Chicanes, which place physical obstacles or parking bays, staggered on alternate sides of the street so that motor vehicles must slow down to maneuver through the street,
  - Traffic throttles/pinch points that restrict a two-way road over a short distance to a single lane,
  - “No Entry” signage restricting through motor vehicle access,
  - Surface treatments including textured surfaces such as brickwork, paving and rumble strips designed to warn drivers of excessive speed or of an approaching hazard where speeds should be lowered, and
  - Merging the street/sidewalk to the same height and use of the same paving materials so that there is no distinction between the road and sidewalk.
- **Arterial and Major Route Traffic Calming.** Traffic calming would limit motor vehicle speeds to 33 mph on arterials and major routes with the recognition that bicycle and pedestrian activity can still be enhanced. Implement traffic calming on arterials and major routes by:
    - Giving priority to public transit, through development of transit-only lanes in congested corridors,
    - Replacing traffic signals and stop signs with modern roundabouts,
    - Improving pedestrian amenities and safety through making attractive sidewalks, adequately marking crosswalks and constructing medians which provide a refuge for pedestrians crossing major roads. Strategies to facilitate pedestrian travel are discussed in greater detail in TCM 19.

Initial traffic calming efforts should be concentrated in the vicinity of schools, high volume retail streets and designated bike routes. Transportation Fund for Clean Air funds may be available for implementation of traffic calming projects through County program managers.

### **Travel Market Affected**

TCM 20 will affect the entire range of motor vehicle, transit, bicycle and pedestrian trips, including commute travel, school travel, shopping, personal business, recreation, and commercial travel.

### **Effectiveness**

TCM 20 is expected to yield the following emission reductions:

	<u>ROG</u>	<u>NOx</u>
2005	0.54 tpd	0.84 tpd
2015	0.54 tpd	1.59 tpd

Case studies in Europe have shown that traffic calming decreases air pollution from the vehicles that previously used the calmed streets by 10 to 50 percent, due to more consistent travel speeds and fewer stops at stop signs and signals. Calming techniques are most effective when implemented on an area-wide basis.

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## **Cost**

The cost of traffic calming ranges from \$9 per square yard to \$18 per square yard of street/sidewalk. These costs are outweighed by the benefits of reduced traffic accidents and congestion. In 1990, traffic accidents alone cost the nation up to \$137 billion a year in direct costs, lost time and productivity. Traffic calming has the potential to reduce injury accidents by 50 percent. Congestion costs were approximately \$40 billion a year in the largest 29 urban areas. The economic benefits from reduced pollution resulting from traffic calming have not been quantified.

## **Impediments**

If traffic calming is not implemented area wide but only in select and isolated streets, there is the potential for an increase in traffic in the surrounding area. Retail on streets with traffic calming may also attract customers from retail in the surrounding area resulting in a decline in sales and viability in the surrounding area. These two potential problems are best solved by implementing an area-wide traffic calming plan.

Design guidelines should be developed with input from local emergency response providers to ensure that traffic calming does not impede the response time. In properly designed traffic calming areas there has been little or no effect on emergency response times. Since studies have shown that there are fewer traffic accidents, there should also be fewer emergencies needing a response.

## **Other Impacts**

Three decades of experience with traffic calming have shown that it successfully solves transportation problems through a reduction in motor vehicle trips and an increase in transit riders, bicyclists and pedestrians. Traffic calming results in motor vehicle speed reductions, leading to less accidents, noise, air pollution, water pollution and congestion. Other beneficial attributes of traffic calming include more livable neighborhoods and vibrant shopping streets. However, traffic and congestion will increase on the adjacent streets and arterials that receive no calming treatment.

## **References**

U.S. Department of Transportation, Federal Highway Administration; "National Bicycling and Walking Study, Case Study No. 19"; FHWA-PD-93-028.